

# **2014 Mesophotic Cruise Report**

## **NOAA NRDA Mesophotic Reefs Technical Working Group**

**22 June-13 July 2014**

**RV Walton Smith**

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RV F.G. Walton Smith, the University of Miami vessel used during the 2014 Mesophotic Cruise



### **Introduction and Background:**

This is the summary cruise report for the third dedicated Mesophotic Cruise, an expedition to assess the health and condition of fishes and corals in mesophotic habitats lying beneath the surface oil slick resulting from the April 2010 Deepwater Horizon (DWH) oil spill, as part of the Natural Resource Damage Assessment (NRDA) for DWH. This series of cruises repeatedly targeted a set of mesophotic reefs over time to assess changes immediately after the spill, one year after the spill, and four years after the spill compared to pre-spill conditions. As used here, the term ‘mesophotic’ refers to a depth range between 60 and 100 meters. The first NRDA Mesophotic cruise was conducted in August 2010 aboard NOAA research vessel RV Nancy Foster and surveyed shelf-edge mesophotic reefs located north and east of the Macondo wellhead site. This cruise was conducted pursuant to the “NRDA Tier 1 for Deepwater Communities” work plan. The second cruise was conducted in September 2011 aboard the Edison Chouest Offshore vessel MV Holiday Chouest. The third and most recent cruise, which is the subject of this report, was conducted between June 22nd and July 13<sup>th</sup> of 2014, on board the University of Miami research vessel RV F.G. Walton Smith. On this cruise the expedition team used the Deep Sea Systems International (DSSI) Global Explorer remotely operated vehicle (ROV) to conduct visual surveys of fish and corals and to collect voucher samples for species identification. The expedition consisted of researchers from US Geological Survey Southeast Ecological Science Center (USGS), Florida State University (FSU), and National Oceanic and Atmospheric Administration National Centers for Coastal Ocean Science (NOAA-NCCOS).

### **Locations and Dates:**

The mesophotic reefs targeted for study in 2014 included Alabama Alps Reef (AAR) and Roughtongue Reef (RTR), which are both large high-relief platform reefs within the Pinnacles reef tract in the northeastern Gulf of Mexico (NEGOM); Yellowtail Reef (YTR), a lower relief Pinnacles Trend reef near Roughtongue Reef; as well as Coral Trees Reef (CTR) and Madison-Swanson Reef (MSR), which includes South Ridge (MSSR) and North Ridge (MSNR), located on the West Florida shelf-edge. The general coordinates (in decimal degrees of latitude and longitude) for the targeted reefs are:

- 1) **MSR:** 29.187170 -85.678480
- 2) **CTR:** 29.505000 -85.146000
- 3) **YTR:** 29.440300 -87.575100
- 4) **RTR:** 29.441500 -87.578500
- 5) **AAR:** 29.254919 -88.338933

The cruise departed from and returned to Gulfport, MS. The cruise plan is shown as originally proposed, and then as implemented in Table 1 and Figure 1. For the most part the cruise proceeded as planned; however, minor issues such as low visibility due to

reduced water clarity, ROV problems, subsea navigation outages, and ship engine issues resulted in some deviations from the plan. The primary deviation from the original plan was an early departure from AAR to RTR on June 26<sup>th</sup> due to poor visibility on AAR. We returned to AAR after three days on RTR. Doing so resulted in one less day of sampling on YTR. Daily activity reports from the cruise are attached as Appendix 1.

### **Methods:**

The ROV used for the 2014 cruise was the DSSI Global Explorer (Deep Sea Systems International, Cataumet, MA) (Figures 2 & 3). There were three video cameras on board, and a digital still camera. The video cameras were 1) a pair of 3.8X zoom DSSI Ocean ProHD (1920X1080i, 16:9 format, 3 megapixel CMOS chip) cameras mounted at a slight angle to each other to give 3-D footage and 2) a 10X zoom DSSI Ocean ProHD (1920X1080i, 16:9 format, 3 megapixel CMOS chip). The 10X zoom camera was mounted on the top work bar pointed down at a fixed 70 degree down angle. The 3-D cameras were mounted on a centrally located pan and tilt bracket, 61 cm above the bottom of the ROV. Also mounted on the pan-tilt was the digital still camera, which was an 18 megapixel DSSI DPC-8800.

There were four green lasers set in a square configuration centered around the camera lens at a distance of 10 cm from each other. There was also a pair of spread beam green lasers mounted parallel to each other at 30 cm spacing on the top bar. The 3.8X HD cameras had 110 degree field-of-view (FOV) in wide angle, and 29 degree FOV at full zoom. The 10X HD camera had 88 degree FOV in wide angle, and 8.8 degree FOV in full zoom. Video data was recorded to SD cards using four Panasonic® AG-HMR 10 SD recorders, recording the left 3.8X, right 3.8X, the downlooking 10X, and the left and right 3.8X cameras together as 3-D. The left 3.8X camera was also recorded to a Panasonic DVCPro HDTV recorder on AJ-P126 tapes.

The ROV had an extendable, centrally mounted bio-box and an extendable port-side mounted rack of 6" diameter PVC quivers for sample collections, as well as a single Orion seven-function spatially correspondent manipulator arm on the starboard side. There were four forward mounted 200 watt LED lights on the work bar, and two 100 watt LED lights on the pan tilt unit with the cameras. The ROV was also equipped with a BlueView P450-130D multibeam sonar, used for locating reefs when first descending, for locating the rotary cameras, and the new markers after deployment.

### **Sampling Activities:**

The primary objectives of the cruise were to conduct systematic video transects for fish counts and coral health assessment, to conduct image sampling in a randomized design for post-to-pre DWH comparisons, to collect biological samples of unidentified octocorals, to deploy rotary time-lapse cameras for fish counts over 24-48 hour periods, and to relocate markers deployed in 2011 for comparative photo-documentation of

individual sea fan colonies between cruises. A secondary objective of the cruise was to characterize water chemistry on each of the reefs during the sampling period. Maps showing the spatial distribution of these activities on each reef are provided in Figures 4A-8B, with the 'A' figures showing the distribution of rotary camera deployments and random images, and the 'B' figures showing transect segments and coral sample sites. Due to the large spatial extent of Madison Swanson Reef, the North Ridge and South Ridge are shown separately, as Figure 6A,B,C,& D.

### **Water Column Profiles:**

At least one water column profile was collected for each target study site using the ship CTD. A ship CTD cast was made on the first day at a reef. The ship CTD was a Seabird SB11+, equipped as shown in Table 2. There were 11 casts made (Table 3). Plots of the shipboard CTD casts from the cruise are in Figures 9-19. The ROV had a CTD which was on throughout the duration of the dives. The ROV CTD was a Seabird SBE-37 which transmitted in real time, measuring temperature, depth, and conductivity only. The file was captured and logged as a text file at 10 second intervals. The ROV CTD did not have the internal time and date set correctly; multiple attempts to resolve the issue were unsuccessful. Therefore, start and stop times for the ROV CTD were logged in the cruise logs.

### **Dives:**

There were 24 ROV dives made during the cruise (Table 4). Total bottom time was 8,120 minutes. Dive activities were split between video transects, rotary camera deployments, random down-looking images, marker relocation and deployments, and biological sampling of corals (Table 5). Dive activities were focused primarily on the reeftops.

### **Transects:**

There were 303 transects conducted for coral health and fish counts during the cruise (Table 6). During transects, the port 3.8X video camera was set to wide zoom and down angle. The ROV was driven in as straight a line as practical over reef-top habitat for five minutes, as slow as was practical (generally between 0.2 and 0.3 knots). Direction of transect was chosen so that the track would remain over reef-top with as little duplication of existing transects as possible. Sectors transected were chosen so as to have as thorough a sample of the representative reef-top habitat as possible. There were 45 transects on AAR, 68 on CTR, 92 on MSSR, 60 on RTR, and 38 on YTR. Total ROV time in designated transects is 1,448 minutes.

### **Rotary Camera Deployments:**

There were two identical rotary time-lapse cameras (RTLCS) used during the cruise. The rotary time lapse cameras were Nikon Coolpix 5400 cameras mounted on a rotating

platform inside a glass housing (Figure 20). Illumination was provided by a 150 watt strobe mounted with the camera. The camera frame rotated 36 degrees after each picture, taking 10 pictures for a complete rotation. A full rotation normally took 30 minutes (three minutes between frames). For identification purposes, the cameras were named “Huey” and “Duey”. They were deployed and recovered using the ROV. They were deployed on the bottom for a combined total of 492 hours (Huey: 9 deployments for 198.58 hours; Duey: 2 deployments for 293.02 hours), distributed over all five reefs (Table 7A & 7B). Pre-cruise planning envisioned both cameras deployed for similar durations; however, at-sea circumstances with ROV, ship, and camera issues resulted in Duey being deployed for multiple days at only two locations, while Huey was deployed in more locations, but for shorter periods. There were 10,020 pictures taken while the RTLC’s were on the bottom (Table 7A & 7B).

### **Random Downlooking Images:**

The 10X HD camera mounted on the top work bar was used to take video frame grabs at points randomly preselected in either 50 or 100 meter diameter circles on the reeftops (Table 8). Fifty points were photographed in the 50 M circles, and 100 points were photographed in the 100 m circles. The ROV was directed to each random point by a navigator who did not have access to the video feed so that the frame grabs would be unbiased. A frame grab was taken with the ROV at rest using the parallel lasers as a scale reference. There were 1,036 grabs taken, during 1,926 minutes of bottom time.

### **Markers:**

In 2014, we relocated 11 of 12 markers deployed in 2011, and 1 of 1 marker deployed in 2010, then photographed the coral colonies associated with the markers (Table 9). Markers were uniformly overgrown and very difficult to locate. Marker B, on RTR, (N 29.43851763, W 87.57589347) was not relocated. Marker I was recovered as the coral colony it was marking was deceased and toppled. All other relocated markers were left in place. Markers deployed in 2011 consisted of a weight attached by poly rope to either: a block of polyethylene (Table 9: Markers 1,2,3,4,5,8); or a rope loop with a plastic tab (Table 9: Markers U,X,A,I,V,B; Figure 21). The marker deployed in 2010 was a Monkeys Fist knot. There were six markers deployed near coral colonies on AAR, and seven deployed on RTR. Most marked colonies showed signs of injury.

We deployed 18 new markers during the 2014 cruise (Table 9). Sixteen were heavy steel bases with an 18” upright, with a foam float, poly rope and poly float (Table 9: Markers 1-16; Figure 21). Two markers were low concrete domes with poly ropes and markers deployed in close proximity to each other (Table 9: Markers A & K; Figure 22). Four of the new markers were co-located with existing markers from 2011 (Figure 21).

**Digital Still Photographs:**

The DSSI DPC-8800 digital camera was mounted on the pan and tilt at 61.6 cm height on the ROV. Internal components were an 18 megapixel Canon EOS modified by DSSI for remote control and viewing. The camera was used in several modes. On several dives it was set to take pictures automatically at 3 second intervals. Most of the time, it was manually controlled by the ROV co-pilot. Zoom and focus were adjusted by eye. F-stop was automatically adjusted using the camera's internal bracketing software. There were 31,540 digital stills taken during the cruise (Table 10). No digital stills were taken during dive GX003 (a 40 minute dive for rotary camera deployment).

**Coral Collections:**

There were 132 sample collections taken during the cruise (Table 11). All but one of the samples were corals; the non-coral collection was one of the markers deployed in 2011 (Marker I). The focus of coral sampling was to identify smaller, lesser known sea fans to genus and species level for consideration in future assessments. Samples were photographed in-situ before sampling, and placed into PVC quivers, then capped with rubber stoppers. Once the ROV was on deck, samples were removed from the quivers using ethanol soaked forceps and then were placed immediately into individual plastic bags for processing in the lab. All specimens were photographed in the lab on a clean stage with a scale and sampling label (Figure 23), then sub-sampled with separate aliquots preserved dry and in ethanol for the purposes of morphological and genetic species identification, respectively. Large samples with holdfasts were dried under the fume hood. Some epifauna were present on the corals. These were maintained in the sample bag with the coral colony.

**Navigation:**

All transects, collections, and bottom operations of the ROV were navigated with use of a Linkquest USBL (ultrashort baseline) system consisting of a transmitter mounted on the ROV and a transponder pole-mounted on the RV Walton Smith. The system recorded vehicle location at regular (~10 s) intervals and on special command when a location-fix was needed to record a sampling or survey event (e.g. image collection or transect start/end). Annotation for all navigation events was entered into the tracking system.

**Data Archiving:**

The SD cards containing the camera video were copied daily onto four sets of redundant hard drives; all paper logs and data sheets were also scanned and copied onto the hard drives. Daily, the ROV CTD, digital stills, and video frame grabs were copied from the ROV control van computers and transferred onto the redundant hard drives. The hard drives were QA/QC'ed by comparing all file names and sizes throughout the process. At the end of the cruise, all ship-side weather, CTD, and water quality data were transferred

onto the hard drive sets. Data sets were distributed to NOAA-NCCOS, FSU, USGS, and NOAA-Natural Resource Damage Assessment.

**Personnel:**

The 2014 cruise was divided into two legs.

Personnel for Leg 1 were (Figure 24):

Dr. Peter Etnoyer, NOAA, Chief Scientist, Co-PI, Coral Biologist  
JD Dubick, NOAA, Coral Biologist  
Mike Randall, USGS, Co-PI, Fish Biologist  
Ursula Nash, USGS, GIS analyst  
Melissa Price, USGS, Fish Biologist  
Dr. Ian Macdonald, FSU, Co-PI, Oceanographer  
Peter Lazarevich, FSU, Navigator  
Mauricio Silva, FSU, Imaging Technician  
Nick Bach, Dade Moeller Associates, NRDA data manager  
Toshi Mikagawa, DSSI, ROV supervisor  
Mike Nicholson, DSSI, ROV technician  
James Sherwood, DSSI, ROV pilot

Personnel for Leg 2 were (Figure 25):

Mike Randall, USGS, Chief Scientist, Co-PI, Fish Biologist  
Ann Foster, USGS, GIS analyst  
Jared Jacobini, USGS, Fish Biologist  
Caroline Johansen, FSU, Imaging specialist  
Eric Howarth, FSU, Navigator  
Mauricio Silva, FSU, Imaging specialist  
Janessy Frometa, NOAA, Coral Biologist  
Leslie Wickes, NOAA, Coral Biologist  
Nick Bach, Dade Moeller Associates, NRDA data manager  
Toshi Mikagawa, DSSI, ROV supervisor  
Mike Nicholson, DSSI, ROV technician  
James Sherwood, DSSI, ROV pilot

## TABLES

Table 1. 2014 Mesophotic Cruise plan as proposed (left) and as implemented (right).

### Leg 1 planned

June 23	Transit to AAR
June 24 - 27	AAR sampling
June 27	Transit to RTR
June 28 - 30	RTR sampling
June 30	Transit to YTR
July 1	YTR sampling
July 1	Transit to Gulfport
July 2	0600 arrive Gulfport

### Leg 1 actual

June 23	Transit to AAR
June 24 - 26	AAR Sampling
June 26	Transit to RTR
June 27- 29	RTR sampling
June 29	Transit to AAR
June 30-July 1	AAR sampling
July 1	Transit to Gulfport
July 2	0800 arrive Gulfport

### Leg 2 planned

July 3	Transit to YTR
July 4 - 5	YTR sampling
July 5	Transit to CTR
July 6 - 8	CTR sampling
July 8	Transit to MSR
July 9 -11	MSR sampling
July 11	Transit to RTR
July 12	RTR sampling
July 12	Transit to Gulfport
July 13	Disembark in Gulfport

### Leg 2 actual

July 3	Transit to YTR
July 4 -5	YTR sampling
July 5	Transit to CTR
July 6 -8	CTR sampling
July 8	Transit to MSR
July 9 -11	MSR sampling
July 11	Transit to RTR
July 12	RTR & YTR sampling
July 12	Transit to Gulfport
July 13	Disembark in Gulfport



Table 2. Sensors on the RV Walton Smith shipboard CTD.

<b>Sensor</b>	<b>ID number</b>	<b>Calibration Date</b>
Temperature	MTG #177. SN 4097	Feb 22, 2103
Conductivity	MTG #053. SN 1851	Feb 20, 2013
Pressure (Digiquartz)	MTG # 193 SN 0692	Nov 12, 2013
Oxygen, SBE 43	MTG #156 SN 0520	March 22, 2013
Fluorometer, Seapoint	MTG # 195	Dec 12, 2008

Table 3. Casts 1-11 of the Walton Smith CTD during the 2014 Mesophotic Cruise:

<b>Cast #</b>	<b>Reef</b>	<b>Date</b>	<b>Time</b>	<b>Event #</b>	<b>Latitude</b>	<b>Longitude</b>
WS001	AAR	6/24/14	10:42	1003	29.24973	-88.33937
WS002	AAR	6/26/14	20:28	1105	29.25183	-88.24209
WS003	RTR	6/27/14	7:33	1106	29.43582	-87.58094
WS004	RTR	6/29/14	20:00	1423	29.43744	-87.57143
WS005	AAR	6/30/14	5:55	1424	29.25764	-88.34286
WS006	AAR	6/30/14	18:42	1553	29.25208	-88.34209
WS007	AAR	7/01/14	17:53	1622	29.25341	-88.34355
WS008	YTR	7/04/14	7:42	1623	29.45602	-87.60177
WS009	CTR	7/06/14	7:31	1803	29.51184	-86.15012
WS010	MSR	7/09/14	7:39	2216	29.18074	-85.68614
WS011	RTR	7/12/14	7:56	2635	29.43329	-87.56829

Table 4. ROV dives conducted on the 2014 Mesophotic Cruise.

<b>Dive Number</b>	<b>Date</b>	<b>Location</b>	<b>Start Time</b>	<b>Duration (minutes)</b>	<b>Comments</b>
GX001	6/24/14	AAR	13:03	68	Float test; ROV issues
GX002	6/24/14	AAR	14:20	124	
GX003	6/24/14	AAR	18:08	40	Camera Deploy
GX004	6/25/14	AAR	10:51	504	Ship issues from 8:31-10:51
GX005	6/25/14	AAR	11:06	384	
GX006	6/26/14	AAR	17:43	91	Marker deployments
GX007	6/27/14	RTR	8:47	447	
GX008	6/28/14	RTR	8:23	634	
GX009	6/29/14	RTR	8:27	252	
GX010	6/29/14	RTR	13:59	266	
GX011	6/30/14	AAR	7:47	355	
GX012	6/30/14	AAR	14:10	239	
GX013	7/1/14	AAR	8:28	516	
GX014	7/4/14	YTR	8:52	17	No tracking
GX015	7/4/14	YTR	14:09	267	Poor location accuracy
GX016	7/5/14	YTR	8:24	575	
GX017	7/6/14	CTR	8:57	528	
GX018	7/7/14	CTR	8:19	313	
GX019	7/8/14	CTR	8:22	579	
GX020	7/9/14	MSSR	8:39	539	
GX021	7/10/14	MSSR	8:25	555	
GX022	7/11/14	MSNR	8:20	432	
GX023	7/12/14	RTR	9:19	195	No tracking
GX024	7/12/14	YTR	14:10	200	No tracking

Table 5. Summary of dive activities for 2014 NRDA Mesophotic Cruise

Dive	Date	Reef	Dive Time (min)	Stills	Transects	Transect Time (min)	Samples Collected	Random Images	Marker Located	Marker Deployed	Rotary Camera	
											Deploy/ Relocate	Recovery
GX001	6/24	AAR	68	137	1	6.6						
GX002	6/24	AAR	124	1044	8	45.2						
GX003	6/24	AAR	40								1	
GX004	6/25	AAR	504	229			10	45			1	
GX005	6/25	AAR	384	497	1	2.5	11					1
GX006	6/26	AAR	91	160						3		
GX007	6/27	RTR	447	1652	17	88.9	2	82			1	
GX008	6/28	RTR	634	3244	25	135.3	34	117			2	
GX009	6/29	RTR	252	683	2	13.8	1		5	1		1
GX010	6/29	RTR	266	1957	16	78.2	5		1	4		
GX011	6/30	AAR	355	969	8	28.6		75		2		1
GX012	6/30	AAR	239	1150	13	54.8	17				1	
GX013	7/1	AAR	516	1577	14	71.1	8	35	6			1
GX014	7/4	YTR	17	3								
GX015	7/4	YTR	267	195	19	86.9						
GX016	7/5	YTR	575	2328	19	104.8	7	100		2	1	
GX017	7/6	CTR	528	2894	27	130.9	12	150			1	
GX018	7/7	CTR	313	1496	20	103.7	4				2	
GX019	7/8	CTR	579	1661	21	90.3		148		2	1	1
GX020	7/9	MSSR	539	3011	37	148.7	19	88			1	
GX021	7/10	MSSR	555	2578	27	100.1		96		2		1
GX022	7/11	MSNR	432	3216	28	157.7	2	100			1	
GX023	7/12	RTR	195	224								1
GX024	7/12	YTR	200	635								1
<b>Total</b>			<b>8,120</b>	<b>31,540</b>	<b>303</b>	<b>1,448.1</b>	<b>132</b>	<b>1,036</b>	<b>12</b>	<b>16</b>	<b>13</b>	<b>9</b>

Note: In this table MSSR refers to Madison-Swanson South Ridge and MSNR refers to Madison-Swanson North Ridge

Table 6. Designated transects for coral health and fish counts conducted during the 2014 Mesophotic Cruise.

<b>Transect #</b>	<b>Dive</b>	<b>Reef</b>	<b>Start Time</b>	<b>Duration</b>
001	GX001	AAR	14:02:35	0:06:34
002	GX002	AAR	14:29:02	0:05:58
003	GX002	AAR	14:36:39	0:04:56
004	GX002	AAR	14:42:37	0:06:53
005	GX002	AAR	15:36:19	0:05:56
006	GX002	AAR	15:42:36	0:05:09
007	GX002	AAR	15:58:46	0:05:29
008	GX002	AAR	16:09:56	0:05:19
009	GX002	AAR	16:15:58	0:05:32
010	GX005	AAR	11:11:06	0:02:32
011	GX007	RTR	09:34:49	0:06:47
012	GX007	RTR	09:42:28	0:04:52
013	GX007	RTR	09:48:32	0:04:56
014	GX007	RTR	09:54:14	0:05:26
015	GX007	RTR	10:00:26	0:05:10
016	GX007	RTR	10:07:58	0:05:30
017	GX007	RTR	10:15:24	0:05:24
018	GX007	RTR	10:31:00	0:05:10
019	GX007	RTR	10:37:27	0:05:39
020	GX007	RTR	10:45:52	0:02:42
021	GX007	RTR	10:49:22	0:05:24
022	GX007	RTR	10:56:56	0:06:22
023	GX007	RTR	11:21:27	0:04:48
024	GX007	RTR	11:28:13	0:05:38
025	GX007	RTR	11:37:52	0:05:08
026	GX007	RTR	11:44:18	0:05:54
027	GX007	RTR	11:51:28	0:04:02
028	GX008	RTR	09:11:45	0:05:15
029	GX008	RTR	09:34:09	0:06:59
030	GX008	RTR	10:14:00	0:01:54
031	GX008	RTR	10:17:15	0:05:04
032	GX008	RTR	11:30:08	0:06:52
033	GX008	RTR	12:09:21	0:10:51
034	GX008	RTR	12:23:40	0:03:45
035	GX008	RTR	12:33:53	0:05:18
036	GX008	RTR	12:39:53	0:05:42

037	GX008	RTR	12:46:00	0:05:18
038	GX008	RTR	12:51:57	0:05:15
039	GX008	RTR	12:57:15	0:05:19
040	GX008	RTR	13:02:35	0:04:52
041	GX008	RTR	13:07:27	0:03:42
042	GX008	RTR	13:12:30	0:05:11
043	GX008	RTR	13:19:45	0:05:07
044	GX008	RTR	13:25:14	0:07:18
045	GX008	RTR	13:32:52	0:05:56
046	GX008	RTR	13:41:00	0:06:00
047	GX008	RTR	17:43:56	0:04:27
048	GX008	RTR	17:53:46	0:05:17
049	GX008	RTR	18:00:22	0:05:43
050	GX008	RTR	18:08:51	0:04:12
051	GX008	RTR	18:14:20	0:05:44
052	GX008	RTR	18:21:00	0:04:15
053	GX009	RTR	10:45:32	0:07:18
054	GX009	RTR	12:06:24	0:06:29
055	GX010	RTR	15:22:04	0:03:17
056	GX010	RTR	15:47:49	0:05:11
057	GX010	RTR	15:53:52	0:05:20
058	GX010	RTR	16:00:42	0:05:39
059	GX010	RTR	16:06:23	0:05:06
060	GX010	RTR	16:12:20	0:05:22
061	GX010	RTR	16:17:44	0:05:30
062	GX010	RTR	16:24:16	0:05:14
063	GX010	RTR	16:29:32	0:05:34
064	GX010	RTR	16:36:14	0:03:40
065	GX010	RTR	16:41:08	0:05:08
066	GX010	RTR	16:46:34	0:04:58
067	GX010	RTR	16:51:34	0:03:56
068	GX010	RTR	16:57:27	0:05:05
069	GX010	RTR	17:39:53	0:05:05
070	GX010	RTR	17:45:02	0:04:05
071	GX011	AAR	11:28:27	0:05:07
072	GX011	AAR	11:33:36	0:05:01
073	GX011	AAR	11:40:33	0:01:28
074	GX011	AAR	11:46:26	0:05:08
075	GX011	AAR	11:53:04	0:07:28
076	GX011	AAR	12:00:36	0:00:26

077	GX011	AAR	12:05:28	0:00:39
078	GX011	AAR	12:10:55	0:03:18
079	GX012	AAR	14:23:33	0:06:29
080	GX012	AAR	14:30:06	0:04:26
081	GX012	AAR	14:35:06	0:01:26
082	GX012	AAR	14:41:10	0:05:04
083	GX012	AAR	14:46:14	0:03:14
084	GX012	AAR	14:49:58	0:05:28
085	GX012	AAR	14:58:31	0:02:58
086	GX012	AAR	15:02:17	0:02:58
087	GX012	AAR	15:05:27	0:01:30
088	GX012	AAR	15:16:22	0:05:28
089	GX012	AAR	15:22:34	0:06:26
090	GX012	AAR	15:30:36	0:05:36
091	GX012	AAR	15:39:44	0:03:42
092	GX013	AAR	08:30:30	0:05:10
093	GX013	AAR	08:35:46	0:05:13
094	GX013	AAR	08:41:06	0:05:24
095	GX013	AAR	08:47:00	0:06:00
096	GX013	AAR	08:53:01	0:05:09
097	GX013	AAR	08:58:16	0:05:46
098	GX013	AAR	09:04:10	0:04:58
099	GX013	AAR	09:15:36	0:02:22
100	GX013	AAR	09:25:24	0:04:36
101	GX013	AAR	09:33:34	0:05:15
102	GX013	AAR	09:39:19	0:05:00
103	GX013	AAR	09:44:33	0:04:22
104	GX013	AAR	10:21:10	0:04:26
105	GX013	AAR	10:28:18	0:07:24
106	GX015	YTR	14:14:45	0:02:32
107	GX015	YTR	14:17:18	0:01:12
108	GX015	YTR	14:21:37	0:04:12
109	GX015	YTR	14:27:04	0:05:58
110	GX015	YTR	14:33:50	0:03:44
111	GX015	YTR	14:41:11	0:06:10
112	GX015	YTR	14:51:07	0:03:20
113	GX015	YTR	14:56:17	0:04:40
114	GX015	YTR	15:11:47	0:05:45
115	GX015	YTR	15:18:45	0:05:19
116	GX015	YTR	15:36:46	0:05:14

117	GX015	YTR	15:42:27	0:05:30
118	GX015	YTR	15:49:59	0:04:56
119	GX015	YTR	16:00:11	0:04:56
120	GX015	YTR	16:05:59	0:05:03
121	GX015	YTR	16:12:41	0:04:44
122	GX015	YTR	16:32:34	0:04:25
123	GX015	YTR	16:53:04	0:05:40
124	GX015	YTR	16:58:44	0:03:34
126	GX016	YTR	11:41:30	0:05:10
127	GX016	YTR	11:46:50	0:05:17
128	GX016	YTR	11:52:15	0:03:24
129	GX016	YTR	11:57:13	0:05:56
130	GX016	YTR	12:03:22	0:05:34
131	GX016	YTR	12:09:12	0:05:47
132	GX016	YTR	12:17:47	0:05:13
133	GX016	YTR	12:30:42	0:05:35
134	GX016	YTR	12:36:31	0:06:36
135	GX016	YTR	12:43:07	0:04:10
136	GX016	YTR	12:48:17	0:04:24
137	GX016	YTR	13:32:53	0:06:04
138	GX016	YTR	13:39:25	0:04:54
139	GX016	YTR	13:46:24	0:06:58
140	GX016	YTR	13:54:10	0:05:06
141	GX016	YTR	13:59:18	0:07:52
142	GX016	YTR	14:07:55	0:07:00
143	GX016	YTR	14:15:07	0:05:12
144	GX016	YTR	15:06:42	0:04:38
145	GX017	CTR	09:31:07	0:12:54
146	GX017	CTR	09:44:05	0:01:02
147	GX017	CTR	09:59:17	0:05:44
148	GX017	CTR	10:05:07	0:06:46
149	GX017	CTR	10:19:00	0:01:57
150	GX017	CTR	10:36:29	0:04:42
151	GX017	CTR	10:42:43	0:02:55
152	GX017	CTR	10:54:40	0:02:43
153	GX017	CTR	11:14:30	0:03:33
154	GX017	CTR	11:26:33	0:07:21
155	GX017	CTR	11:38:03	0:04:56
156	GX017	CTR	11:44:00	0:05:11
157	GX017	CTR	11:50:20	0:06:06

158	GX017	CTR	11:56:28	0:04:38
159	GX017	CTR	12:01:06	0:02:44
160	GX017	CTR	12:04:20	0:05:48
161	GX017	CTR	12:11:20	0:04:22
162	GX017	CTR	12:53:35	0:04:25
163	GX017	CTR	12:58:45	0:06:15
164	GX017	CTR	13:07:02	0:06:02
165	GX017	CTR	13:13:08	0:04:47
166	GX017	CTR	13:18:30	0:06:07
167	GX017	CTR	13:27:19	0:04:11
168	GX017	CTR	14:10:00	0:06:00
169	GX017	CTR	17:47:33	0:05:50
170	GX017	CTR	17:53:31	0:02:16
171	GX017	CTR	17:56:53	0:01:37
172	GX018	CTR	08:59:56	0:05:02
173	GX018	CTR	09:15:55	0:05:34
174	GX018	CTR	09:21:37	0:04:24
175	GX018	CTR	09:26:23	0:05:31
176	GX018	CTR	09:31:58	0:02:32
177	GX018	CTR	09:36:05	0:06:10
178	GX018	CTR	09:43:02	0:02:58
179	GX018	CTR	09:46:56	0:07:01
180	GX018	CTR	09:54:13	0:03:10
181	GX018	CTR	09:57:59	0:06:02
182	GX018	CTR	10:04:57	0:00:43
183	GX018	CTR	10:16:28	0:09:45
184	GX018	CTR	10:27:17	0:04:20
185	GX018	CTR	10:33:05	0:05:18
186	GX018	CTR	10:44:51	0:03:39
187	GX018	CTR	10:49:57	0:05:38
188	GX018	CTR	10:57:39	0:03:14
189	GX018	CTR	11:02:31	0:09:45
190	GX018	CTR	11:12:22	0:07:13
191	GX018	CTR	11:45:52	0:05:42
192	GX019	CTR	12:41:34	0:09:24
193	GX019	CTR	13:01:48	0:02:00
194	GX019	CTR	13:04:46	0:02:20
195	GX019	CTR	13:09:16	0:03:26
196	GX019	CTR	13:19:10	0:02:12
197	GX019	CTR	13:57:26	0:03:48



198	GX019	CTR	14:02:56	0:05:39
199	GX019	CTR	14:08:39	0:05:44
200	GX019	CTR	14:14:23	0:05:37
201	GX019	CTR	14:22:00	0:05:18
202	GX019	CTR	14:31:00	0:03:00
203	GX019	CTR	14:36:50	0:06:12
204	GX019	CTR	14:43:40	0:02:22
205	GX019	CTR	14:46:22	0:04:18
206	GX019	CTR	14:53:36	0:04:16
207	GX019	CTR	14:59:18	0:04:44
208	GX019	CTR	15:06:40	0:04:25
209	GX019	CTR	15:39:04	0:06:12
210	GX019	CTR	15:47:32	0:04:17
211	GX019	CTR	15:55:43	0:03:28
212	GX019	CTR	16:56:40	0:01:34
213	GX020	MSSR	12:14:08	0:03:52
214	GX020	MSSR	12:25:49	0:06:19
215	GX020	MSSR	12:32:14	0:05:55
216	GX020	MSSR	12:38:17	0:08:49
217	GX020	MSSR	12:47:08	0:05:50
218	GX020	MSSR	13:04:56	0:06:39
219	GX020	MSSR	13:11:57	0:03:44
220	GX020	MSSR	13:16:13	0:04:36
221	GX020	MSSR	13:21:27	0:02:18
222	GX020	MSSR	13:24:59	0:06:06
223	GX020	MSSR	13:32:03	0:03:26
224	GX020	MSSR	13:37:41	0:01:22
225	GX020	MSSR	13:40:45	0:00:50
226	GX020	MSSR	13:42:37	0:03:48
227	GX020	MSSR	13:47:17	0:01:36
228	GX020	MSSR	13:49:47	0:04:00
229	GX020	MSSR	14:02:36	0:04:47
230	GX020	MSSR	14:08:09	0:03:22
231	GX020	MSSR	14:12:17	0:02:58
232	GX020	MSSR	14:20:16	0:03:58
233	GX020	MSSR	14:24:20	0:00:10
234	GX020	MSSR	14:53:04	0:06:58
235	GX020	MSSR	15:00:06	0:02:54
236	GX020	MSSR	15:05:48	0:05:03
237	GX020	MSSR	15:10:59	0:04:42

238	GX020	MSSR	15:17:11	0:02:49
239	GX020	MSSR	15:21:47	0:02:34
240	GX020	MSSR	15:24:59	0:02:01
241	GX020	MSSR	15:28:25	0:04:19
242	GX020	MSSR	15:33:34	0:02:26
243	GX020	MSSR	15:36:16	0:06:00
244	GX020	MSSR	15:43:02	0:04:58
245	GX020	MSSR	15:48:24	0:02:26
246	GX020	MSSR	16:18:46	0:03:32
247	GX020	MSSR	16:24:24	0:02:40
248	GX020	MSSR	16:29:14	0:06:52
249	GX020	MSSR	16:39:44	0:04:04
250	GX021	MSSR	08:25:49	0:05:01
251	GX021	MSSR	08:34:10	0:03:51
252	GX021	MSSR	08:45:50	0:03:36
253	GX021	MSSR	08:49:44	0:03:01
254	GX021	MSSR	08:53:49	0:02:44
255	GX021	MSSR	08:57:05	0:03:52
256	GX021	MSSR	09:01:38	0:03:38
257	GX021	MSSR	09:05:46	0:04:10
258	GX021	MSSR	09:10:46	0:02:26
259	GX021	MSSR	09:15:25	0:00:48
260	GX021	MSSR	09:17:49	0:05:07
261	GX021	MSSR	09:28:10	0:04:30
262	GX021	MSSR	09:33:29	0:04:44
263	GX021	MSSR	09:42:02	0:01:02
264	GX021	MSSR	09:43:56	0:02:24
265	GX021	MSSR	09:55:36	0:05:08
266	GX021	MSSR	10:01:12	0:02:18
267	GX021	MSSR	10:11:03	0:05:48
268	GX021	MSSR	10:18:11	0:06:07
269	GX021	MSSR	10:25:16	0:02:25
270	GX021	MSSR	10:50:27	0:04:16
271	GX021	MSSR	11:16:38	0:03:02
272	GX021	MSSR	11:20:06	0:02:24
273	GX021	MSSR	11:23:00	0:04:30
274	GX021	MSSR	11:49:07	0:04:28
275	GX021	MSSR	12:35:05	0:03:34
276	GX021	MSSR	12:41:27	0:05:12
277	GX022	MSNR	08:35:22	0:09:42

278	GX022	MSNR	08:45:06	0:05:54
279	GX022	MSNR	08:54:40	0:05:25
280	GX022	MSNR	09:00:17	0:05:16
281	GX022	MSNR	09:07:43	0:04:57
282	GX022	MSNR	09:14:00	0:06:37
283	GX022	MSNR	09:20:41	0:05:27
284	GX022	MSNR	09:29:17	0:07:13
285	GX022	MSNR	09:37:01	0:06:46
286	GX022	MSNR	09:44:13	0:05:47
287	GX022	MSNR	09:50:28	0:04:38
288	GX022	MSNR	09:58:26	0:02:48
289	GX022	MSNR	10:02:54	0:03:24
290	GX022	MSNR	10:07:47	0:04:17
291	GX022	MSNR	10:12:36	0:04:02
292	GX022	MSNR	10:18:00	0:06:44
293	GX022	MSNR	10:31:56	0:06:38
294	GX022	MSNR	10:41:34	0:05:57
295	GX022	MSNR	10:49:55	0:06:44
296	GX022	MSNR	10:59:07	0:04:58
297	GX022	MSNR	11:07:01	0:06:33
298	GX022	MSNR	11:27:30	0:05:30
299	GX022	MSNR	11:44:35	0:05:02
300	GX022	MSNR	11:51:51	0:05:51
301	GX022	MSNR	12:20:48	0:05:54
302	GX022	MSNR	12:28:12	0:05:03
303	GX022	MSNR	12:33:33	0:05:02
304	GX022	MSNR	12:39:33	0:05:33

Note: In this table MSSR refers to Madison-Swanson South Ridge and MSNR refers to Madison-Swanson North Ridge

Table 7A. Deployments and recoveries of rotary time lapse camera “Huey”

<b>Dive</b>	<b>Reef</b>	<b>Date</b>	<b>Time</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Comment</b>	<b>Duration</b>	<b>Frames</b>
GX003	AAR	6/24/14	18:40	29.25333	-88.33948	Deploy #1		
GX005	AAR	6/26/14	14:45	29.25341	-88.33937	Recover #1	44:04:37	878
GX007	RTR	6/27/14	08:51	29.43919	-87.57717	Deploy #2		
GX008	RTR	6/28/14	10:38	29.43915	-87.57701	Recover #2	25:47:53	518
GX008	RTR	6/28/14	10:45	29.43948	-87.57593	Deploy #3		
GX009	RTR	6/29/14	12:15	29.43963	-87.57498	Recover #3	25:30:44	852
GX012	AAR	6/30/14	14:16	29.25148	-88.33746	Deploy #4		
GX013	AAR	7/1/14	16:42	29.25148	-88.33740	Recover #4	26:25:56	520
GX017	CTR	7/6/14	09:02	29.50575	-86.14555	Deploy #5		
GX018	CTR	7/7/14	08:21	29.50578	-86.14548	Recover #5	23:19:00	56
GX018	CTR	7/7/14	08:53	29.49355	-86.14737	Deploy #6		
GX018	CTR	7/7/14	13:30	29.49354	-86.14745	Recover #6	04:37:13	0
GX019	CTR	7/8/14	08:39	29.48302	-86.14012	Deploy #7		
GX019	CTR	7/8/14	17:56	29.48302	-86.14010	Recover #7	09:17:51	363
GX020	MSSR	7/9/14	08:46	29.18760	-85.67821	Deploy #8		
GX021	MSSR	7/10/14	17:40	29.18754	-85.67818	Recover #8	32:54:15	1312
GX022	MSNR	7/11/14	08:31	29.25272	-85.68815	Deploy #9		
GX022	MSNR	7/11/14	15:31	29.25257	-85.68828	Recover #9	07:00:41	273

Note: In this table MSSR refers to Madison-Swanson South Ridge and MSNR refers to Madison-Swanson North Ridge

Table 7B. Deployments and recoveries of rotary time lapse camera “Duey”

<b>Dive</b>	<b>Reef</b>	<b>Date</b>	<b>Time</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Comment</b>	<b>Duration</b>	<b>Frames</b>
GX004	AAR	6/25/14	10:59	29.25504	-88.33900	Deploy #1		
GX011	AAR	6/30/14	12:30	29.25515	-88.33900	Recover #1	121:31:21	2051
GX016	YTR	7/5/14	08:42	29.45121	-87.59146	Deploy #2		
GX023	YTR	7/12/14	12:13	29.45121	-87.59146	Recover #2	171:31:00	3197

Table 8. Count and time interval of random image sampling activities on and adjacent to the reef biotope during the 2014 Mesophotic Cruise.

<b>Reef</b>	<b>Dive</b>	<b># Random</b>		
		<b>Pictures</b>	<b>Start Time</b>	<b>Stop Time</b>
AAR	GX004	45	15:10	18:09
RTR	GX007	82	12:43	15:53
RTR	GX008	17	11:02	11:41
RTR	GX008	100	13:54	16:00
AAR	GX011	75	08:50	11:00
AAR	GX013	35	14:10	15:37
YTR	GX016	100	08:40	11:40
CTR	GX017	150	14:50	17:40
CTR	GX019	148	08:40	12:40
MSSR	GX020	88	09:00	12:15
MSSR	GX021	96	13:00	17:00
MSNR	GX022	100	13:00	15:30

Note: In this table MSSR refers to Madison-Swanson South Ridge and MSNR refers to Madison-Swanson North Ridge

Table 9. Markers relocated or deployed during the 2014 Mesophotic Cruise

<b>Dive</b>	<b>Reef</b>	<b>Time</b>	<b>Latitude</b>	<b>Longitude</b>	<b>2010/11 Marker ID</b>	<b>2014 Marker ID</b>
GX006	AAR	17:59	29.252771	-88.339183	-	8
GX006	AAR	18:21	29.253059	-88.339371	-	6
GX006	AAR	18:45	29.253422	-88.339521	-	12
GX009	RTR	8:42	29.439288	-87.577010	U	3
GX009	RTR	9:58	29.439351	-87.577161	X	1
GX009	RTR	10:37	29.439452	-87.576348	Fist	
GX009	RTR	11:11	29.440192	-87.576182	A	2
GX009	RTR	11:52	29.440387	-87.575992	I	
GX010	RTR	14:07	29.438656	-87.575809	-	A, K
GX010	RTR	14:52	29.438556	-87.575629	V	13
GX010	RTR	15:40	29.438558	-87.575587	-	10
GX011	AAR	8:12	29.257124	-88.339365	-	11
GX011	AAR	8:30	29.257342	-88.339291	-	4
GX013	AAR	9:59	29.252879	-88.339243	2	
GX013	AAR	10:52	29.253153	-88.339354	5	
GX013	AAR	11:45	29.253354	-88.339415	3	
GX013	AAR	12:47	29.254865	-88.339030	4	
GX013	AAR	13:13	29.254952	-88.339109	8	
GX013	AAR	14:05	29.254713	-88.339013	1	
GX016	YTR	13:22	29.449972	-87.592098	-	16
GX016	YTR	17:27	29.450695	-87.592156	-	9
GX019	CTR	13:49	29.488930	-86.139386	-	7
GX019	CTR	16:43	29.481706	-86.140103	-	15
GX021	MSSR	12:14	29.174349	-85.696330	-	5
GX021	MSSR	16:18	29.170477	-85.700091	-	14

Note: In this table MSSR refers to Madison-Swanson South Ridge

Table 10: Count of digital still images taken by dive during the 2014 Mesophotic Cruise

<b>Dive</b>	<b>Date</b>	<b>Reef</b>	<b>Count</b>
GX001	6/24/2014	AAR	137
GX002	6/24/2014	AAR	1044
GX003	6/24/2014	AAR	NA
GX004	6/25/2014	AAR	229
GX005	6/25/2014	AAR	497
GX006	6/26/2014	AAR	160
GX007	6/27/2014	RTR	1652
GX008	6/28/2014	RTR	3244
GX009	6/29/2014	RTR	683
GX010	6/29/2014	RTR	1957
GX011	6/30/2014	AAR	969
GX012	6/30/2014	AAR	1150
GX013	7/1/2014	AAR	1577
GX014	7/4/2014	YTR	3
GX015	7/4/2014	YTR	195
GX016	7/5/2014	YTR	2328
GX017	7/6/2014	CTR	2894
GX018	7/7/2014	CTR	1496
GX019	7/8/2014	CTR	1661
GX020	7/9/2014	MSSR	3011
GX021	7/10/2014	MSSR	2578
GX022	7/11/2014	MSNR	3216
GX023	7/12/2014	RTR	224
GX024	7/12/2014	YTR	635

Note: In this table MSSR refers to Madison-Swanson South Ridge and MSNR refers to Madison-Swanson North Ridge

Table 11. Biological samples collected during the 2014 Mesophotic Cruise.

<b>Dive</b>	<b>Reef</b>	<b>Specimen ID</b>	<b>Preliminary Species ID</b>
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1035-0001A	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1035-0001B	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1036-0002A	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1036-0002B	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1084-0003A	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1084-0003B	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1085-0004A	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1085-0004B	Yellow Plexauridae
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1087-0005A	Swiftia exserta
GX004	AAR	WS5-P1-EO625-T-AAR-GX004-1087-0005B	Swiftia exserta
GX005	AAR	WS5-P1-EO625-T-AAR-GX005-1091-0006A	Yellow Plexauridae
GX005	AAR	WS5-P1-EO625-T-AAR-GX005-1091-0006B	Yellow Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1092-0007A	Yellow Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1092-0007B	Yellow Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1093-0008A	Yellow Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1093-0008B	Yellow Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1094-0009A	Yellow Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1094-0009B	Yellow Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1095-0010A	Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1095-0010B	Plexauridae
GX005	AAR	WS5-P1-EO626-T-AAR-GX005-1095-0011	Swiftia sp.
GX007	RTR	WS5-P1-EO627-T-RTR-GX007-1122-0012A	White Plexauridae
GX007	RTR	WS5-P1-EO627-T-RTR-GX007-1122-0012B	White Plexauridae
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1214-0013A	White Plexauridae
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1214-0013B	White Plexauridae
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1215-0014A	Yellow Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1215-0014B	Yellow Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1216-0015A	White Plexauridae
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1216-0015B	White Plexauridae
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1217-0016A	Nicella Whip
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1217-0016B	Nicella Whip
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1218-0017A	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1218-0017B	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1219-0018A	Nicella
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1219-0018B	Nicella
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1220-0019A	Small Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1220-0019B	Small Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1221-0020A	Large Bebryce



GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1221-0020B	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1222-0021A	Nicella
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1222-0021B	Nicella
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1223-0022A	White Plexauridae
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1223-0022B	White Plexauridae
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1226-0023A	Small Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1226-0023B	Small Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1227-0024A	Nicella
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1227-0024B	Nicella
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1228-0025A	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1228-0025B	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1367-0026A	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1367-0026B	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1368-0027A	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1368-0027B	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1369-0028A	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1369-0028B	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1370-0029A	Large Bebryce
GX008	RTR	WS5-P1-EO628-T-RTR-GX008-1370-0029B	Large Bebryce
GX009	RTR	WS5-P1-EO629-T-RTR-GX009-1390-0030	Marker "I"
GX010	RTR	WS5-P1-EO629-T-RTR-GX010-1418-0031A	Orange Plexauridae
GX010	RTR	WS5-P1-EO629-T-RTR-GX010-1418-0031B	Orange Plexauridae
GX010	RTR	WS5-P1-EO629-T-RTR-GX010-1421-0032A	Orange Plexauridae
GX010	RTR	WS5-P1-EO629-T-RTR-GX010-1421-0032B	Orange Plexauridae
GX010	RTR	WS5-P1-EO629-T-RTR-GX010-1418-0031C	Orange Plexauridae
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1535-0033A	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1535-0033B	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1537-0034A	Orange/Purple Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1537-0034B	Orange/Purple Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1539-0035A	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1539-0035B	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1541-0036A	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1541-0036B	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1543-0037A	Bicolor Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1543-0037B	Bicolor Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1545-0038A	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1545-0038B	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1547-0039A	Yellow Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1547-0039B	Yellow Placogorgia

GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1550-0040A	Orange Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1550-0040B	Orange Placogorgia
GX012	AAR	WS5-P1-EO630-T-AAR-GX012-1550-0040C	Orange Placogorgia
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1615-0041A	Red/Orange Placogorgia
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1615-0041B	Red/Orange Placogorgia
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1617-0042A	Yellow Placogorgia
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1617-0042B	Yellow Placogorgia
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1620-0043A	Swiftia sp.
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1620-0043B	Swiftia sp.
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1621-0044A	Stichopathes
GX013	AAR	WS5-P1-E0701-T-AAR-GX013-1621-0044B	Stichopathes
GX016	YTR	WS5-P1-E0705-T-YTR-GX016-1793-0045A	Orange Plexauridae
GX016	YTR	WS5-P1-E0705-T-YTR-GX016-1793-0045B	Orange Plexauridae
GX016	YTR	WS5-P1-E0705-T-YTR-GX016-1797-0046A	Orange Plexauridae
GX016	YTR	WS5-P1-E0705-T-YTR-GX016-1797-0046B	Orange Plexauridae
GX016	YTR	WS5-P1-E0705-T-YTR-GX016-1798-0047	Large White Plexauridae
GX016	YTR	WS5-P1-E0705-T-YTR-GX016-1799-0048A	Small White Plexauridae
GX016	YTR	WS5-P1-E0705-T-YTR-GX016-1799-0048B	Small White Plexauridae
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1820-0049A	Pale, Small Yellow Plexauridae
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1820-0049B	Pale, Small Yellow Plexauridae
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1821-0050A	Large Yellow Placogorgia/Paramuricea
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1821-0050B	Large Yellow Placogorgia/Paramuricea
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1841-0051A	Bebryce (grandis)
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1841-0051B	Bebryce (grandis)
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1842-0052A	Orange Thesea?
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1842-0052B	Orange Thesea? Yellow
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1996-0053A	Placogorgia/Paramuricea Yellow
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1996-0053B	Placogorgia/Paramuricea
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1842-0054A	White Thesea
GX017	CTR	WS5-P1-E0706-T-CTR-GX017-1842-0054B	White Thesea
GX018	CTR	WS5-P1-E0707-T-CTR-GX018-2024-0055A	Thesea rubra?
GX018	CTR	WS5-P1-E0707-T-CTR-GX018-2024-0055B	Thesea rubra?
GX018	CTR	WS5-P1-E0707-T-CTR-GX018-2025-0056A	Red Placogorgia
GX018	CTR	WS5-P1-E0707-T-CTR-GX018-2024-0056B	Red Placogorgia
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2325-0057A	Small White Plexauridae
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2325-0057B	Small White Plexauridae

GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2331-0058A	White Plexauridae
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2331-0058B	White Plexauridae
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2332-0059A	Purple Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2332-0059B	Purple Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2333-0060A	Pink Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2333-0060B	Pink Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2346-0061B	White Plexauridae
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2346-0061B	White Plexauridae
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2347-0062A	Red Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2347-0062B	Red Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2348-0063A	Orange Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2348-0063B	Orange Unknown
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2353-0064A	Bebryce cinerea (Small)
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2353-0064B	Bebryce cinerea (Small)
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2355-0065A	Placogorgia
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2355-0065B	Placogorgia
GX020	MSSR	WS5-P1-E0709-T-MSSR-GX020-2355-0065C	Placogorgia
GX022	MSNR	WS5-P1-E0711-T-MSSR-GX022-2530-0066A	Bebryce cinerea
GX022	MSNR	WS5-P1-E0711-T-MSSR-GX022-2530-0066B	Bebryce cinerea

Note: In this table MSSR refers to Madison-Swanson South Ridge and MSNR refers to Madison-Swanson North Ridge

## FIGURES

Figure 1. Map of 2014 Mesophotic Cruise track as implemented, showing Leg 1 (in black) at AAR and RTR, and Leg 2 (in red) at YTR, CTR, MSSR, and RTR. The red dot labelled DWH is the location of the Macondo wellhead.

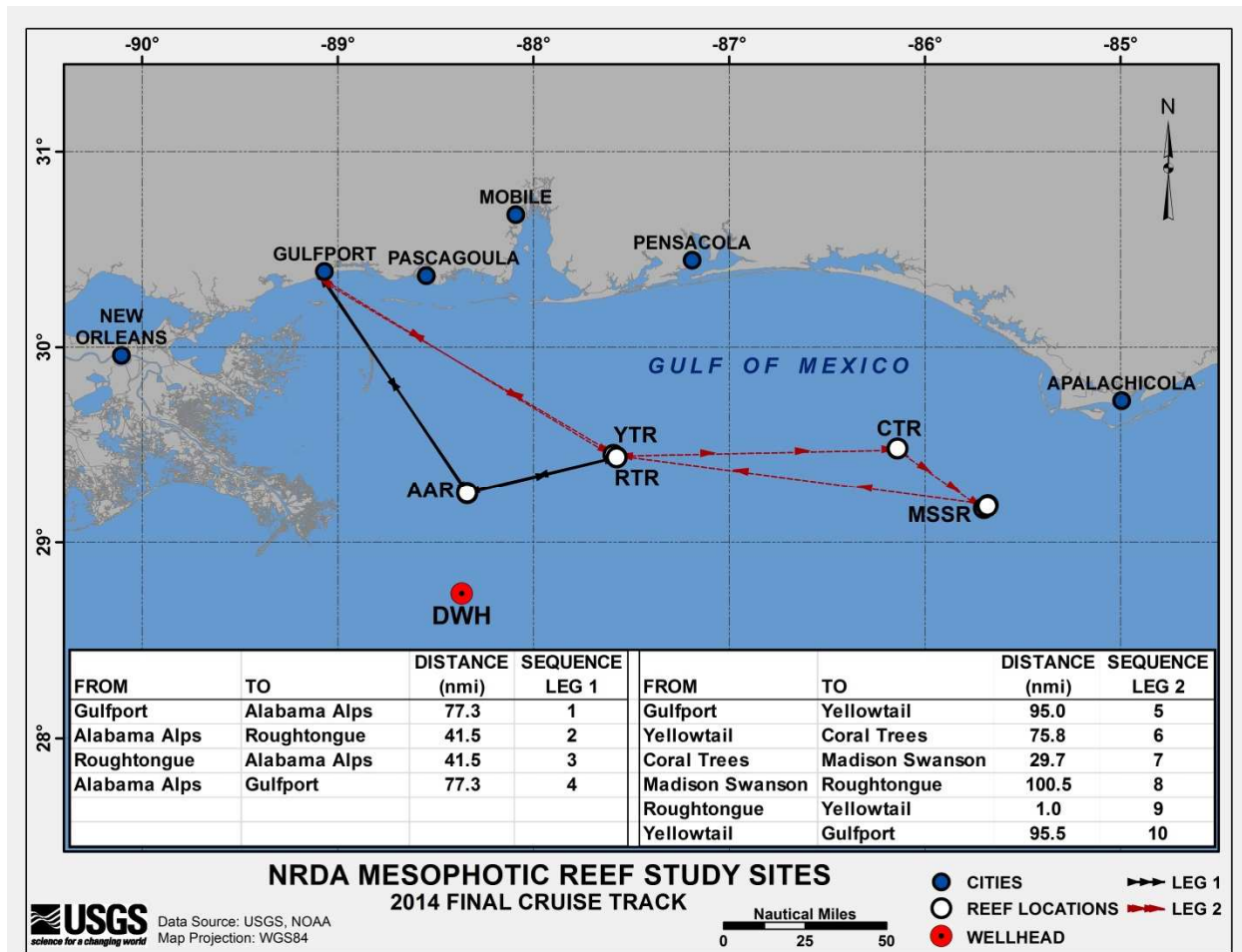


Figure 2. Front of DSSI Global Explorer, showing camera arrangement as deployed

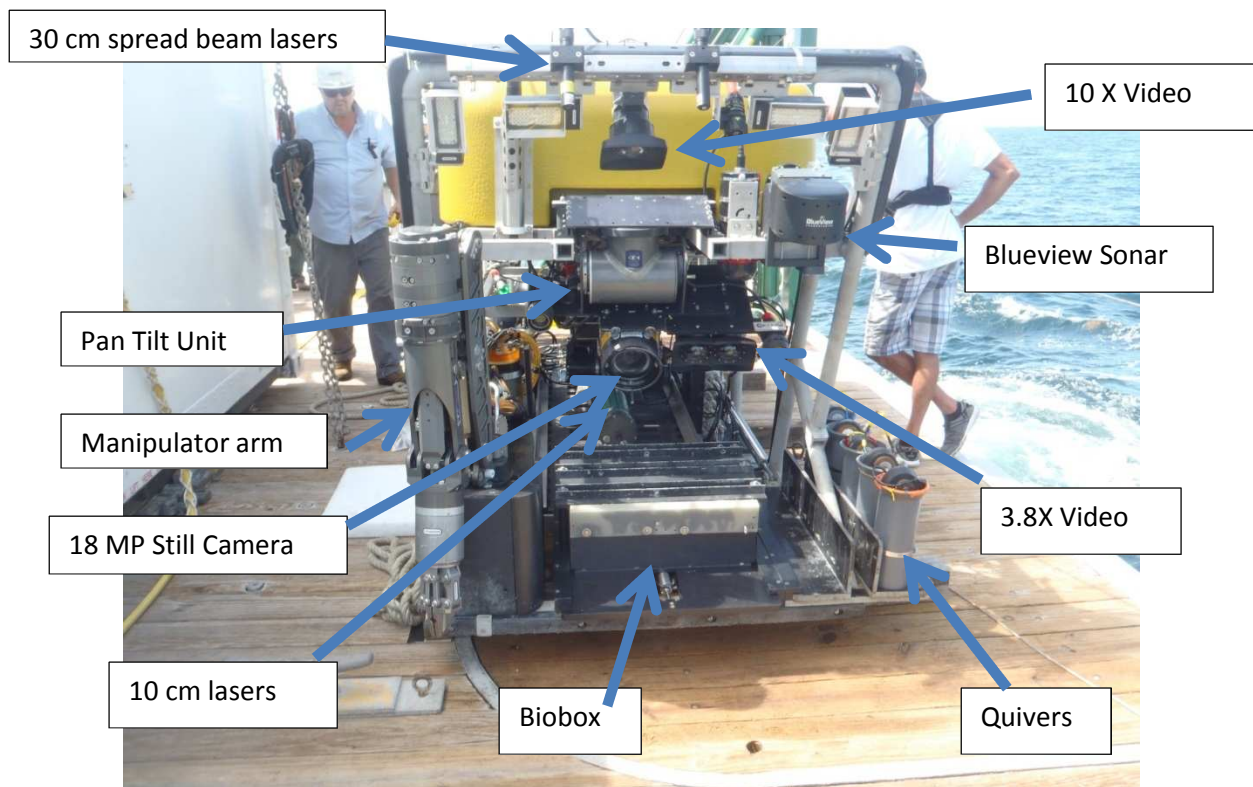


Figure 3. Side view of Global Explorer ROV showing the manipulator on the starboard side.





Figure 4A. Map of rotary camera and random imaging activities on AAR in 2014

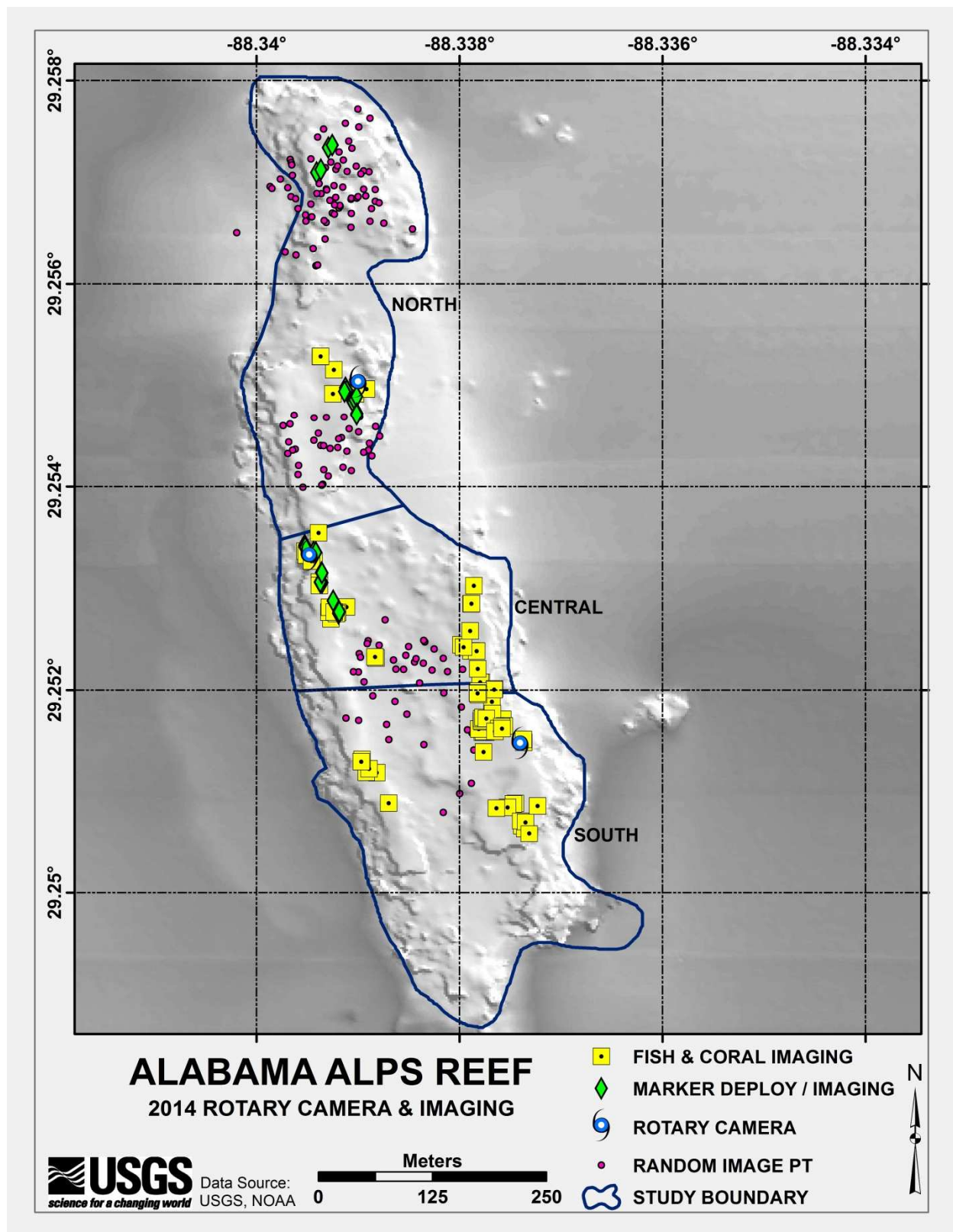


Figure 4B. Map of transect and coral sampling activities on AAR in 2014

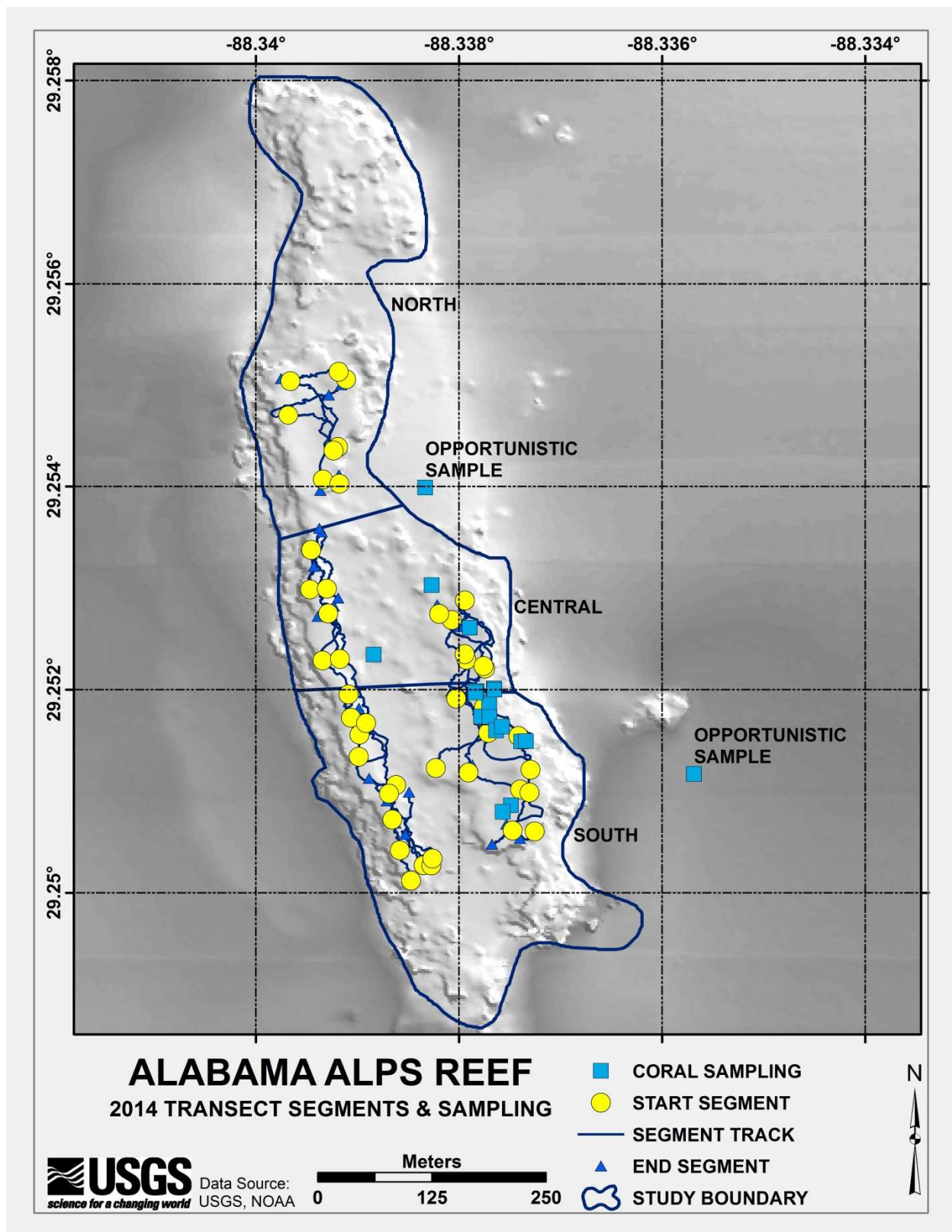


Figure 5A. Map of rotary camera and random imaging activities on CTR in 2014

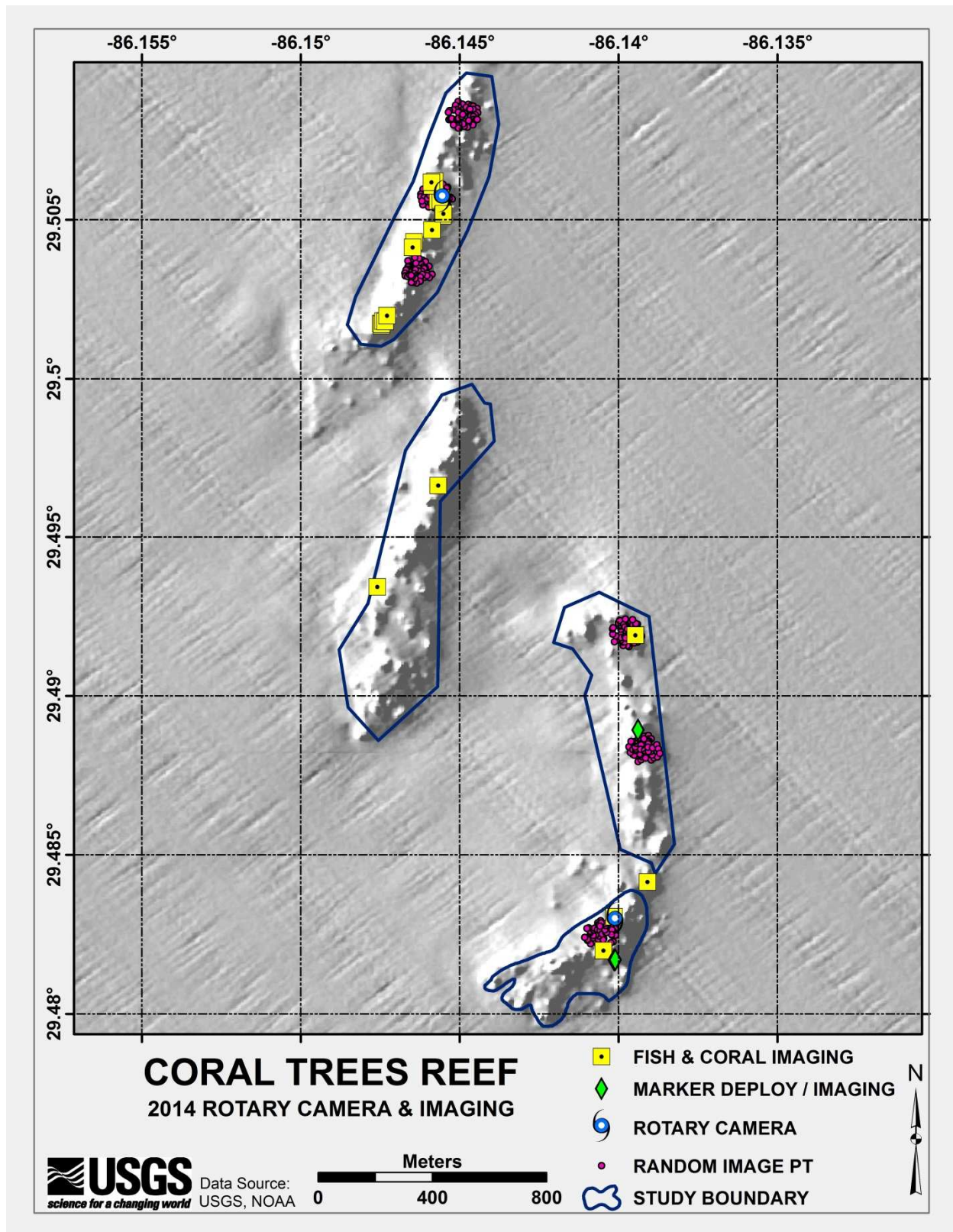




Figure 5B. Map of transect and coral sampling activities on CTR in 2014

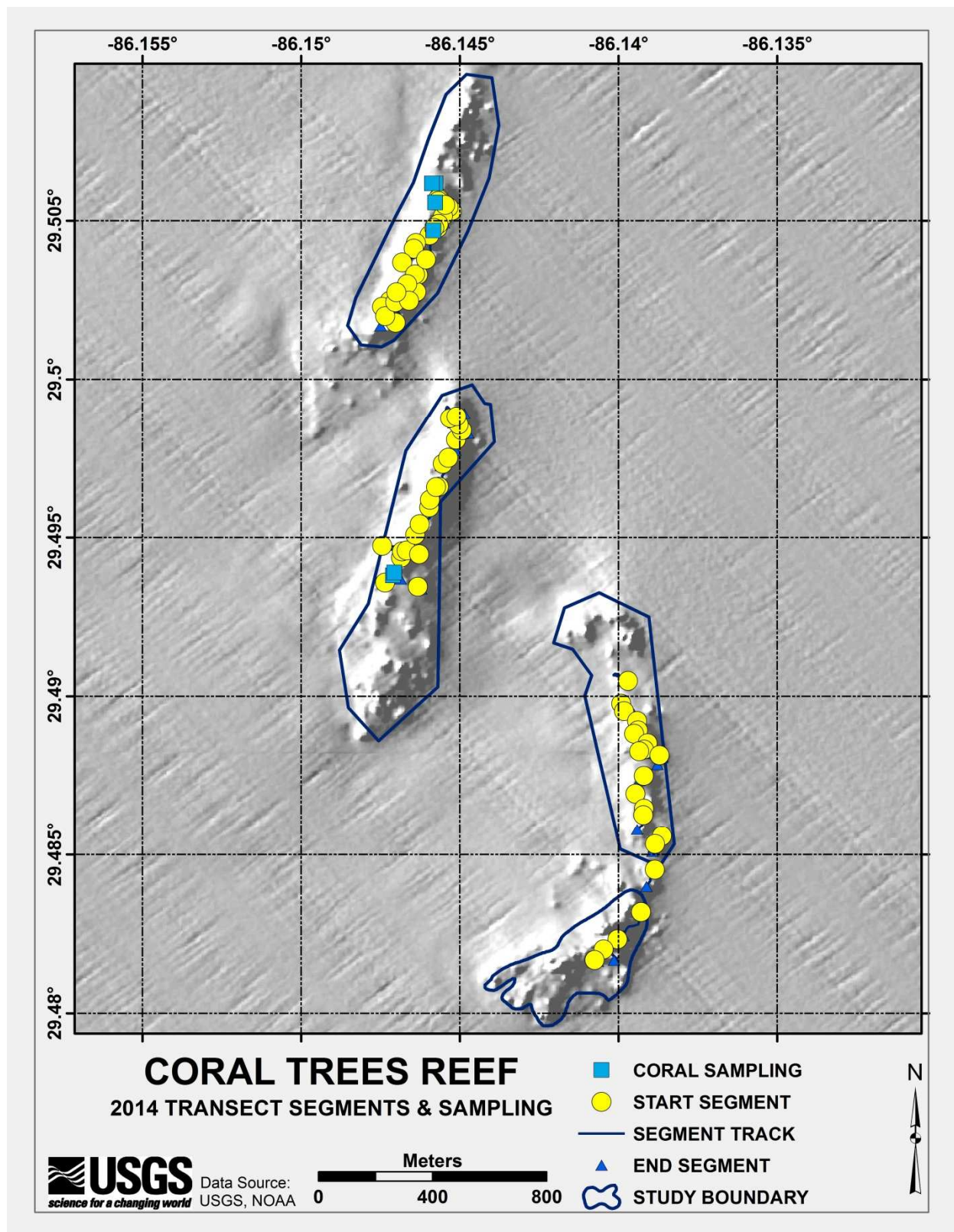


Figure 6A. Map of rotary camera and random imaging activities on MSNR in 2014

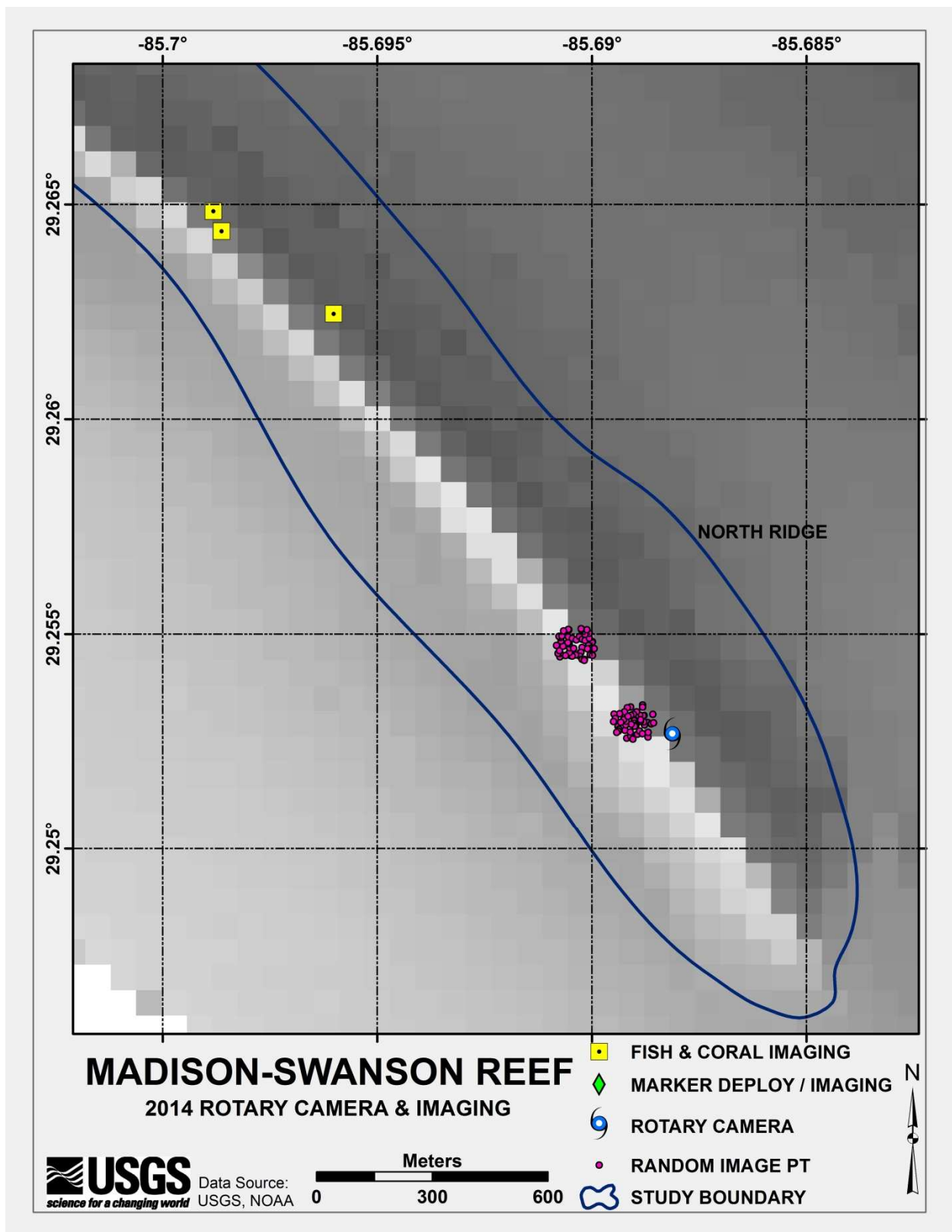


Figure 6B. Map of rotary camera and random imaging activities on MSSR in 2014

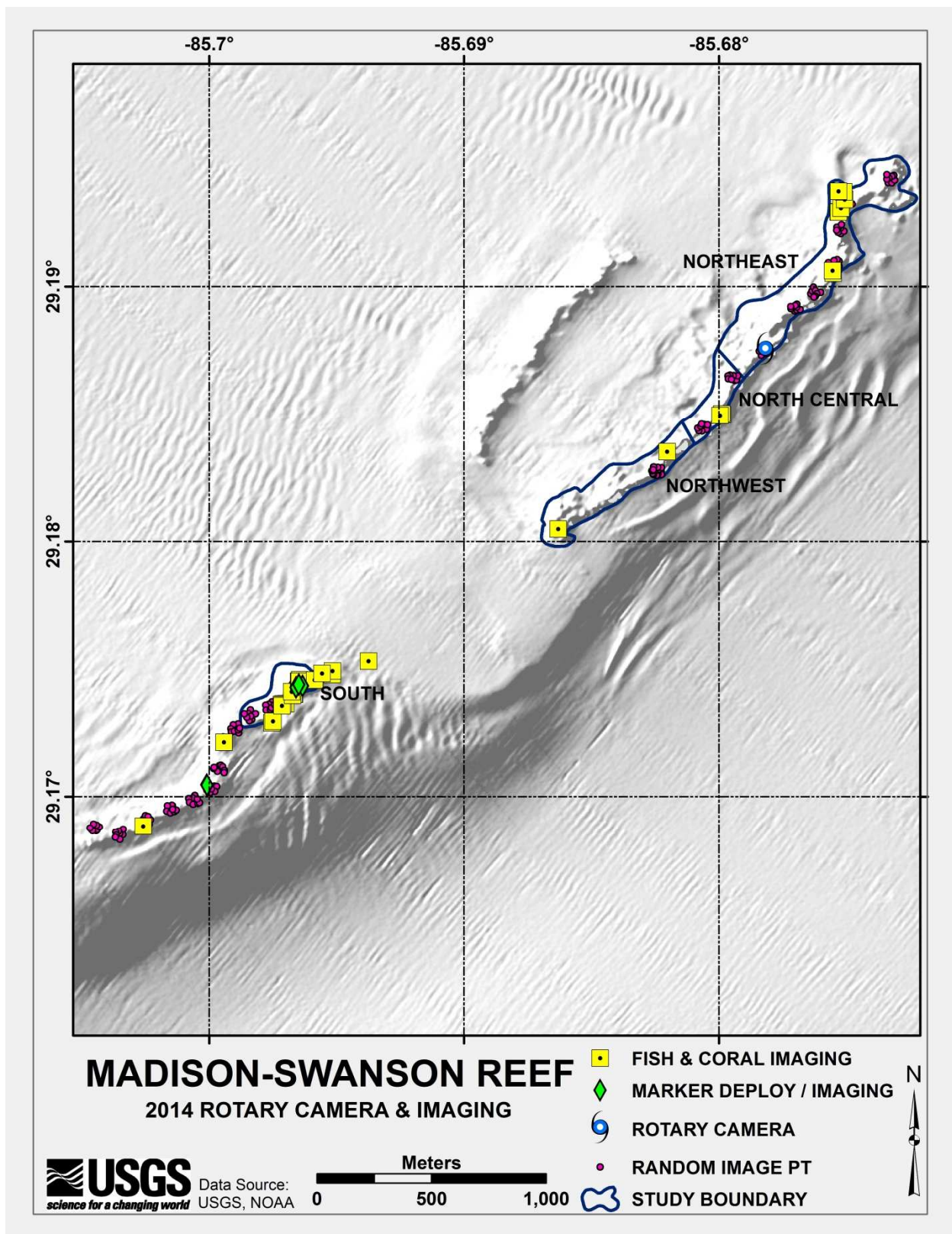




Figure 6C. Map of transect and coral sampling activities on MSNR in 2014

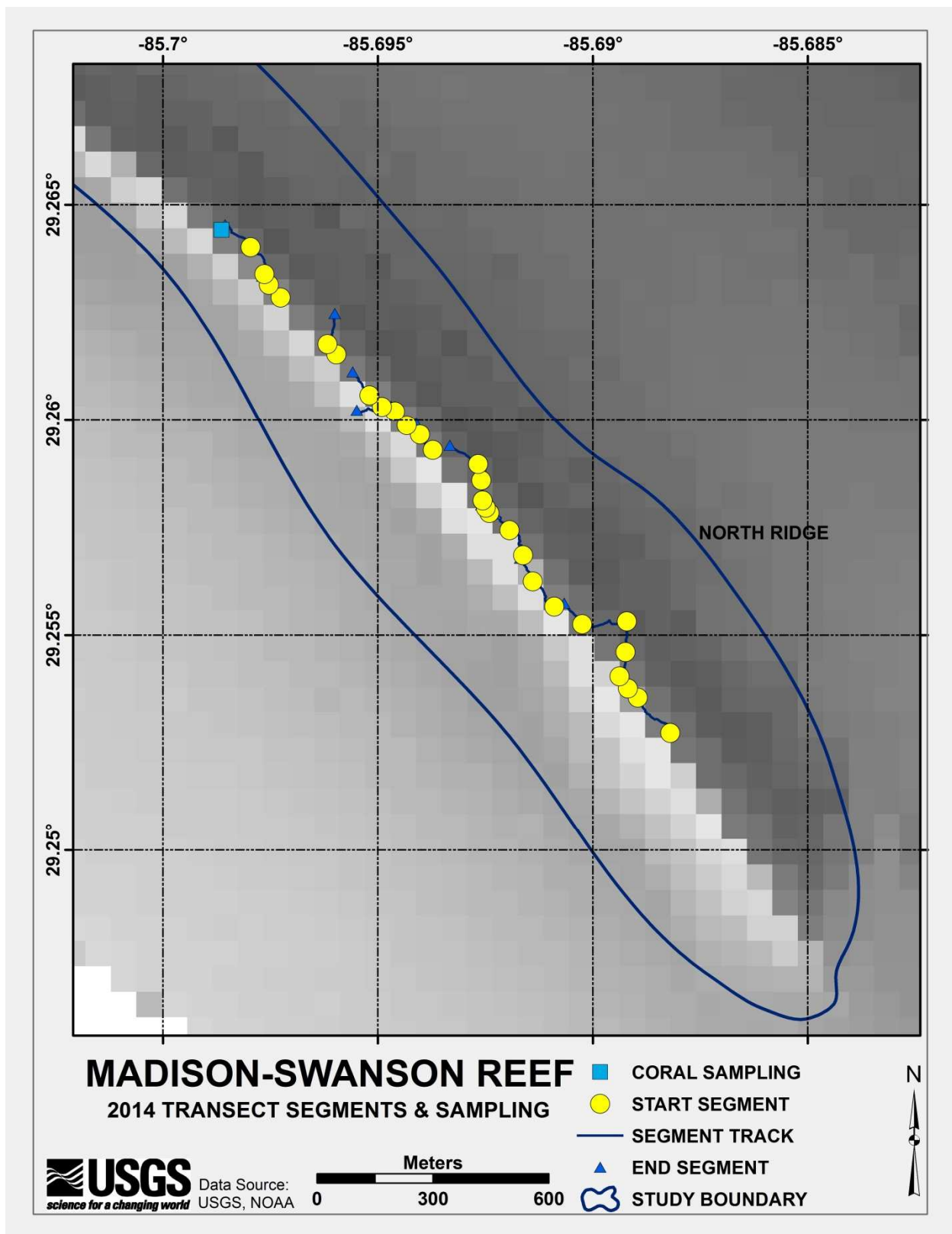


Figure 6D. Map of transect and coral sampling activities on MSSR in 2014

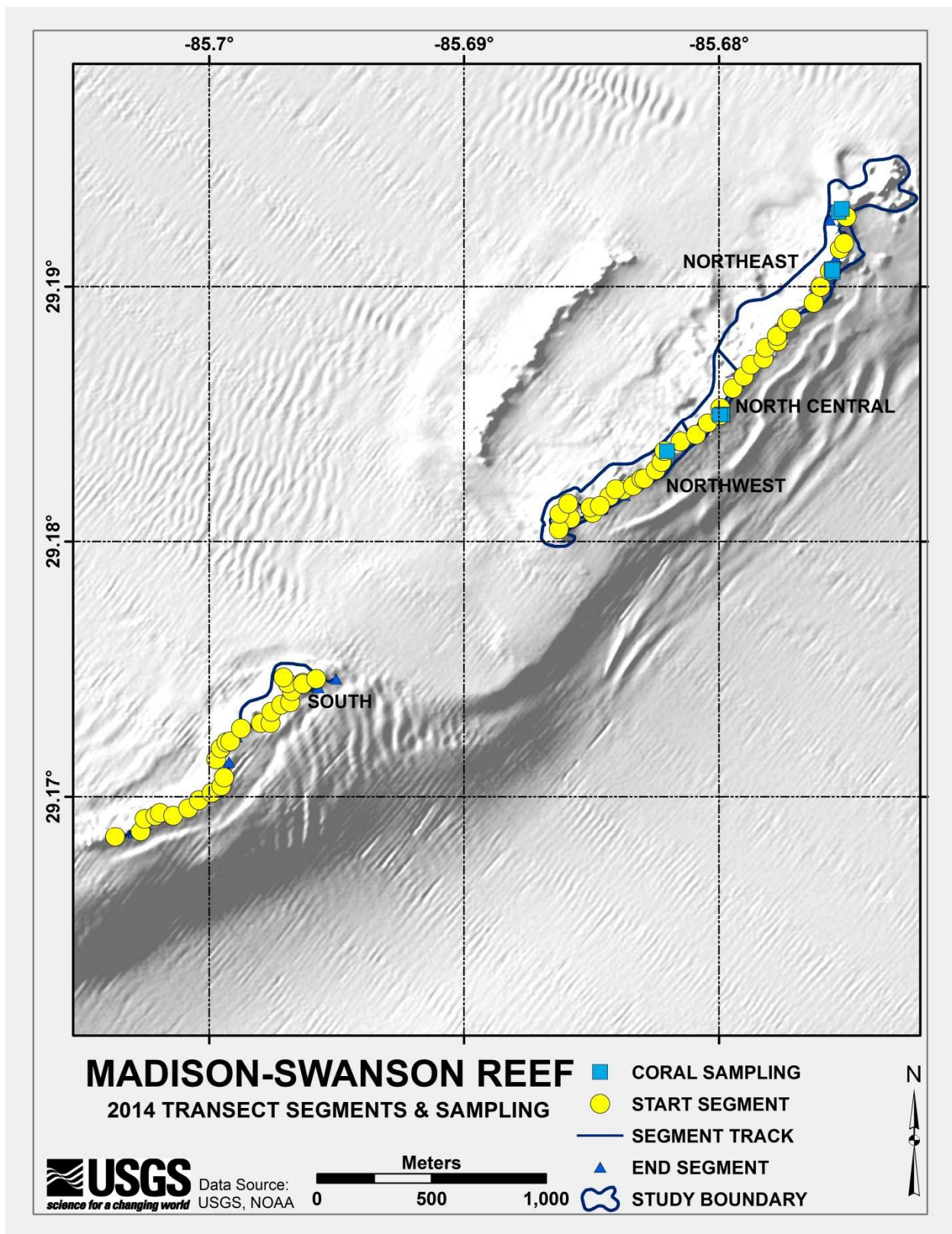


Figure 7A. Map of rotary camera and random imaging activities on RTR in 2014

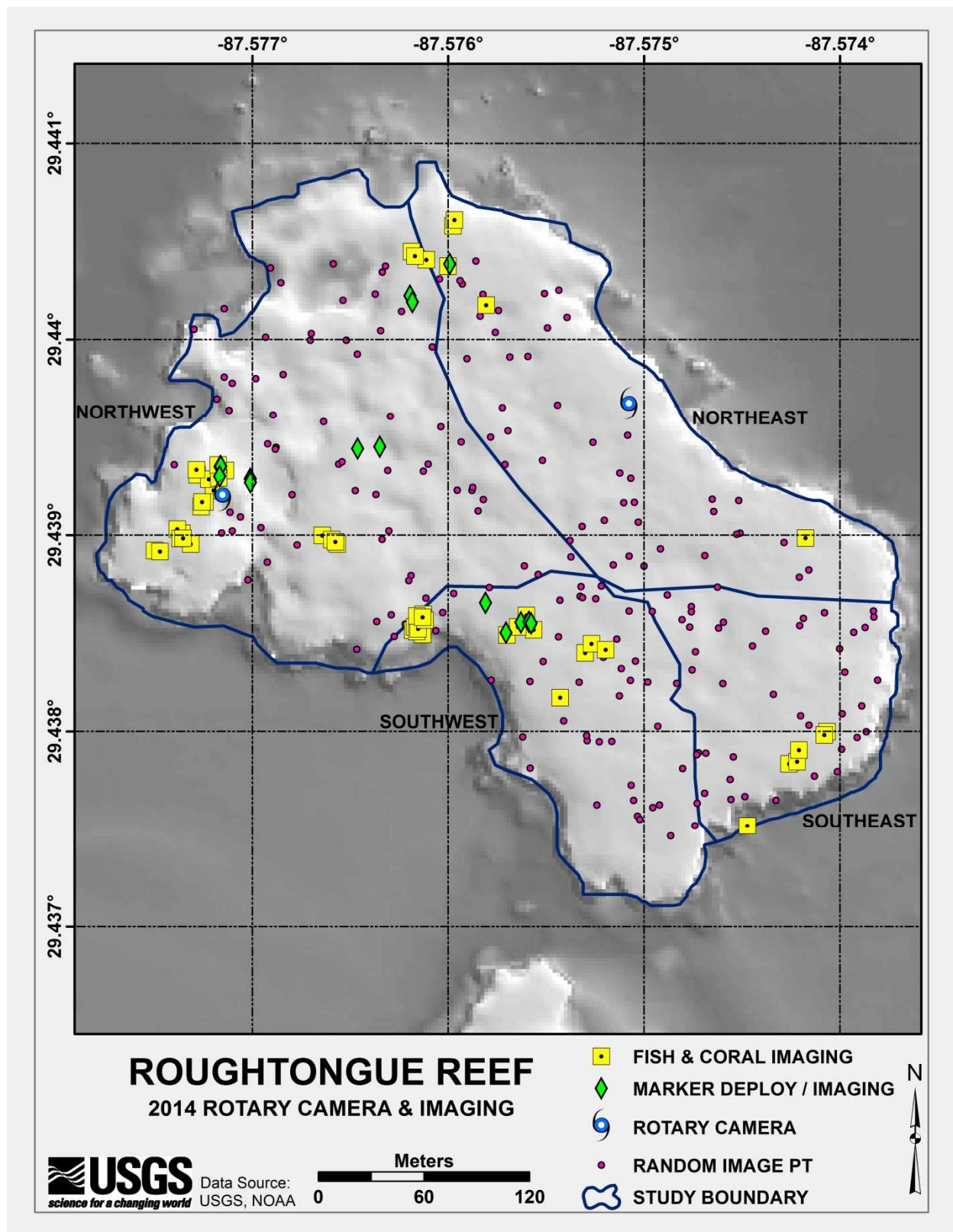




Figure 7B. Map of transect and coral sampling activities on RTR in 2014

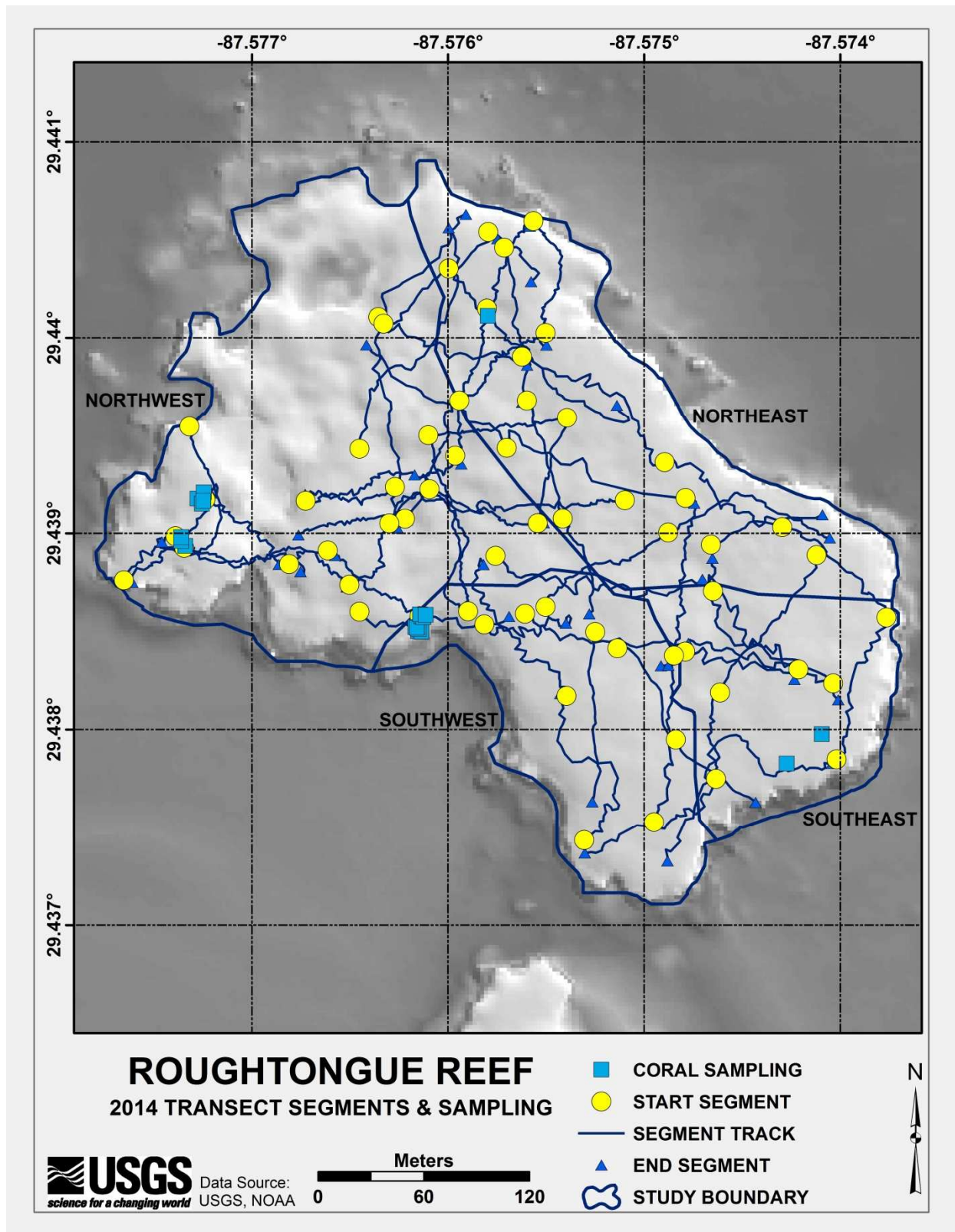


Figure 8A. Map of rotary camera and random imaging activities on YTR in 2014

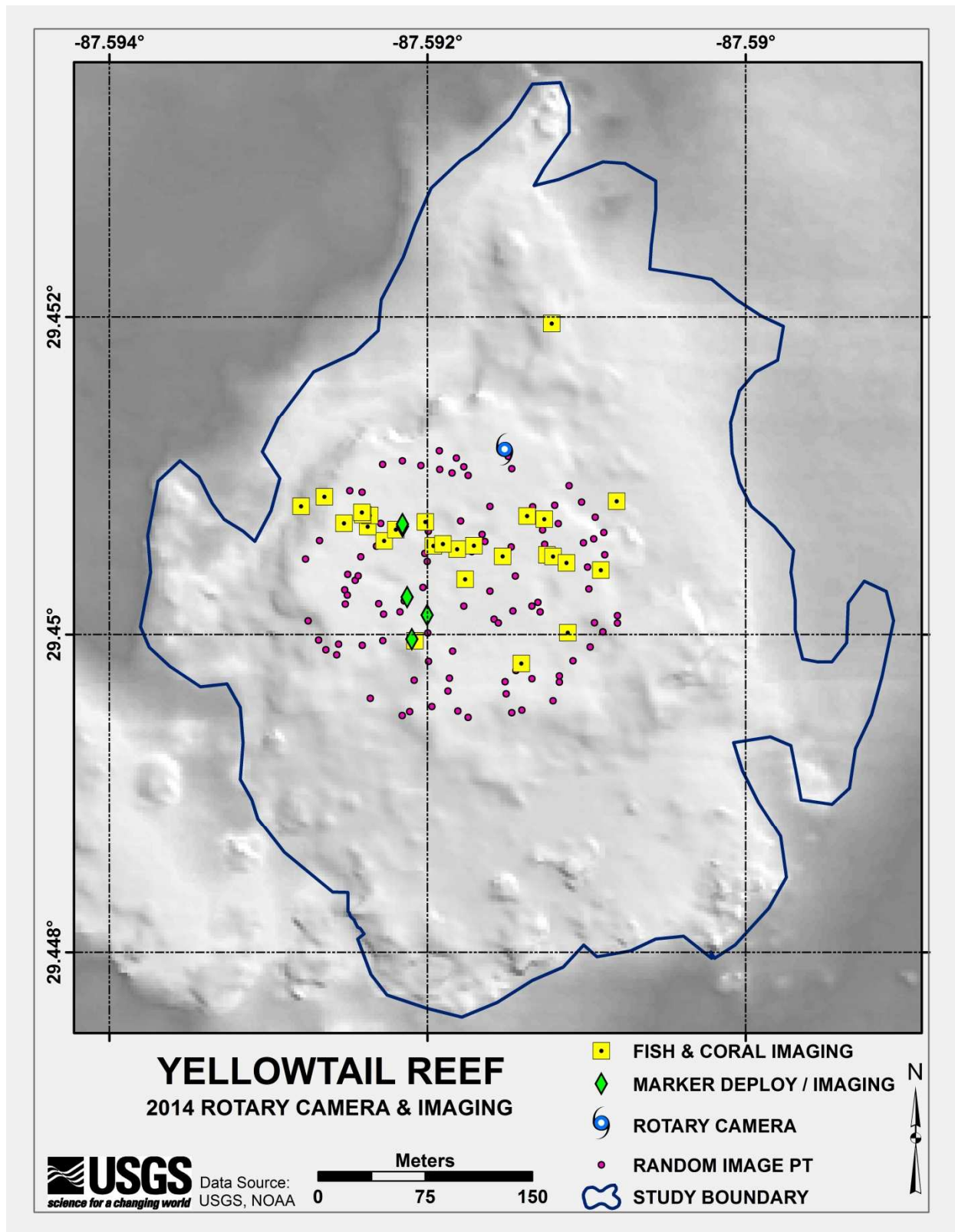




Figure 8B. Map of transect and coral sampling activities on YTR in 2014

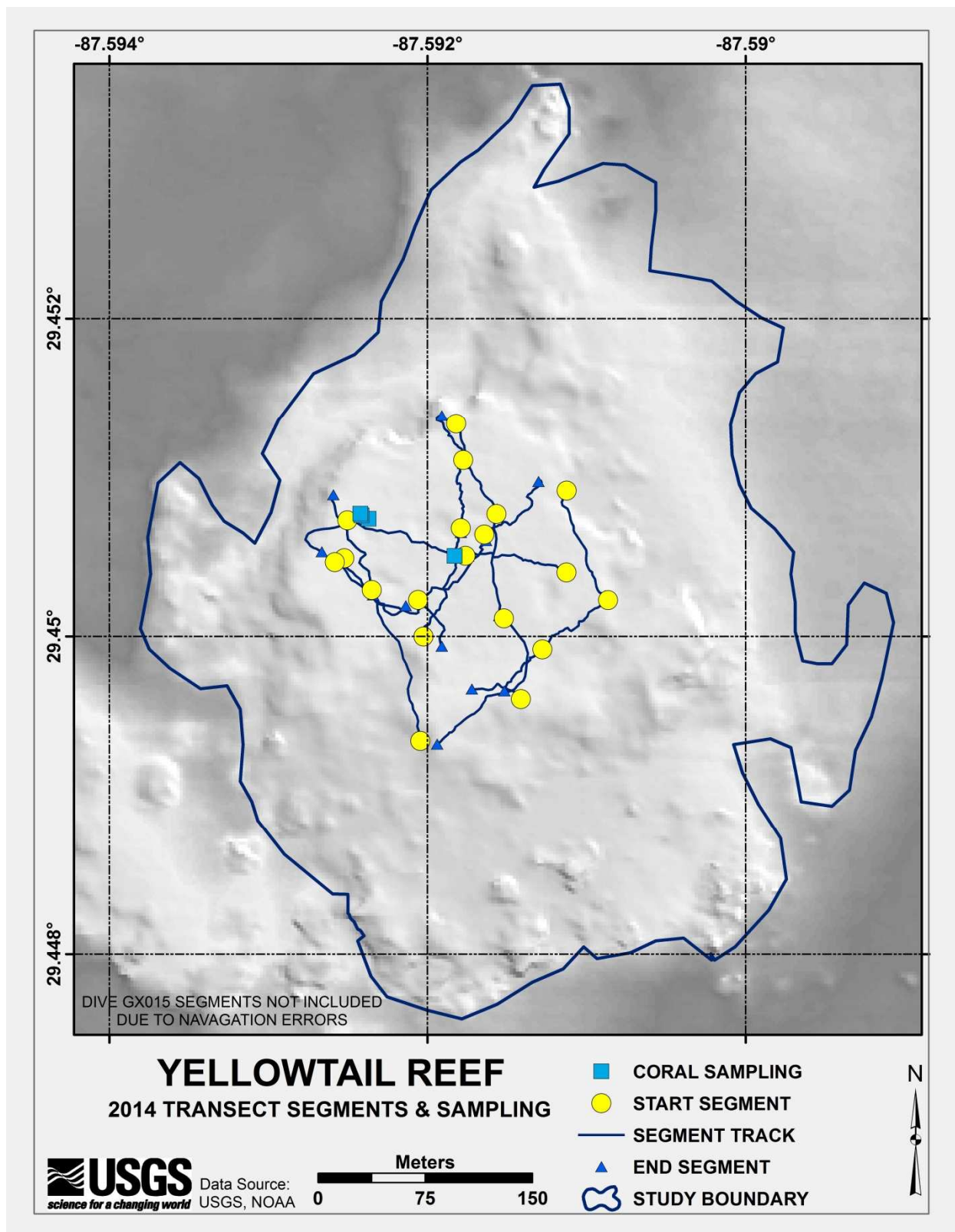


Figure 9. CTD cast WS001 at AAR on June 24, 2014

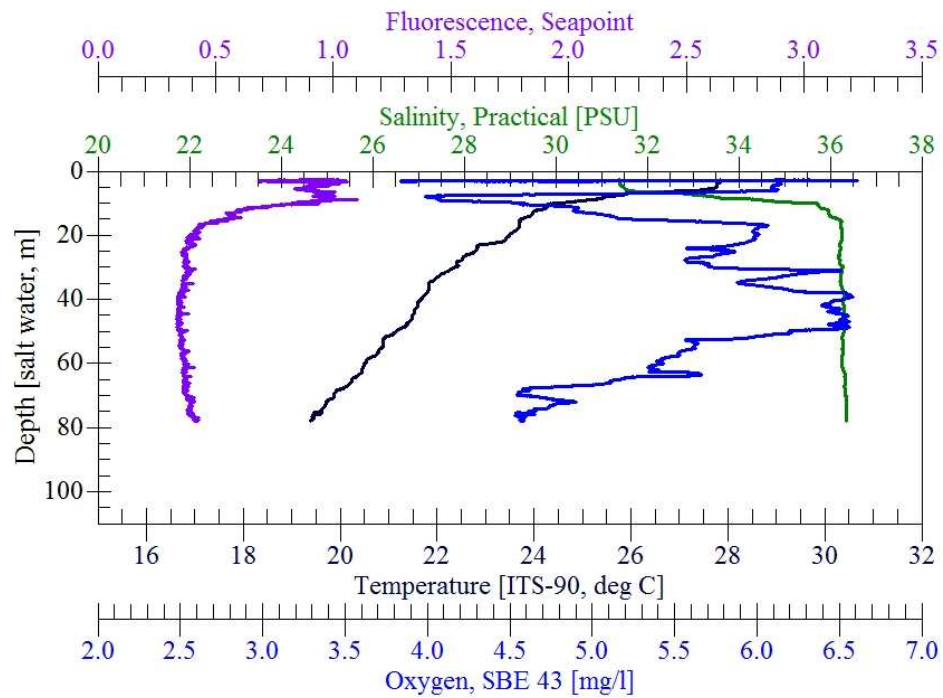


Figure 10. CTD cast WS002 at AAR on June 26, 2014

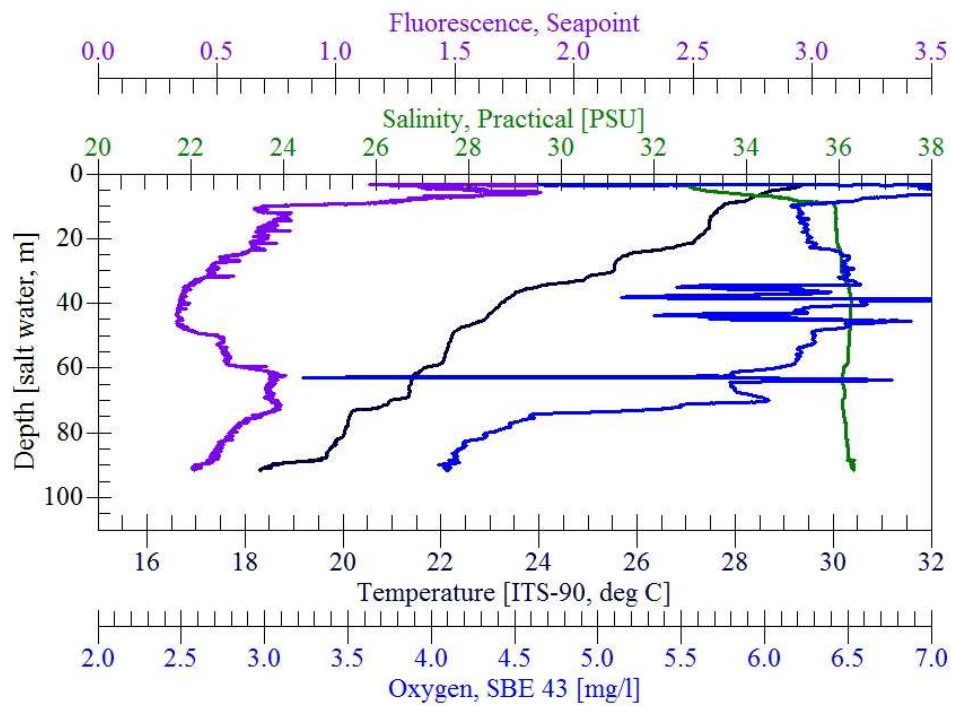


Figure 11. CTD cast WS003 at RTR on June 27, 2014

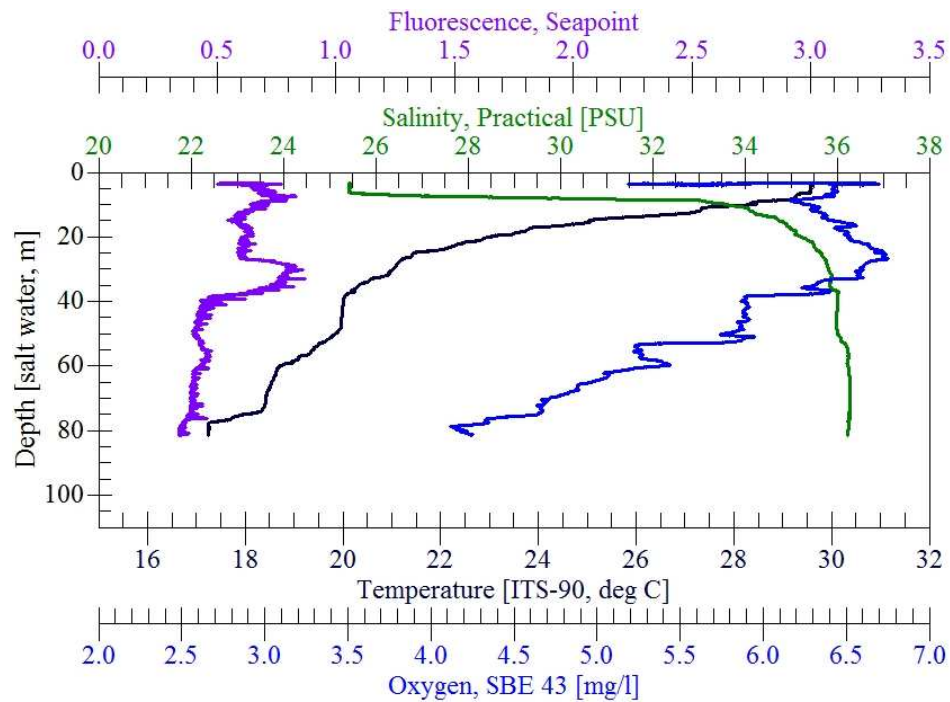


Figure 12. CTD cast WS004 at RTR on June 29, 2014

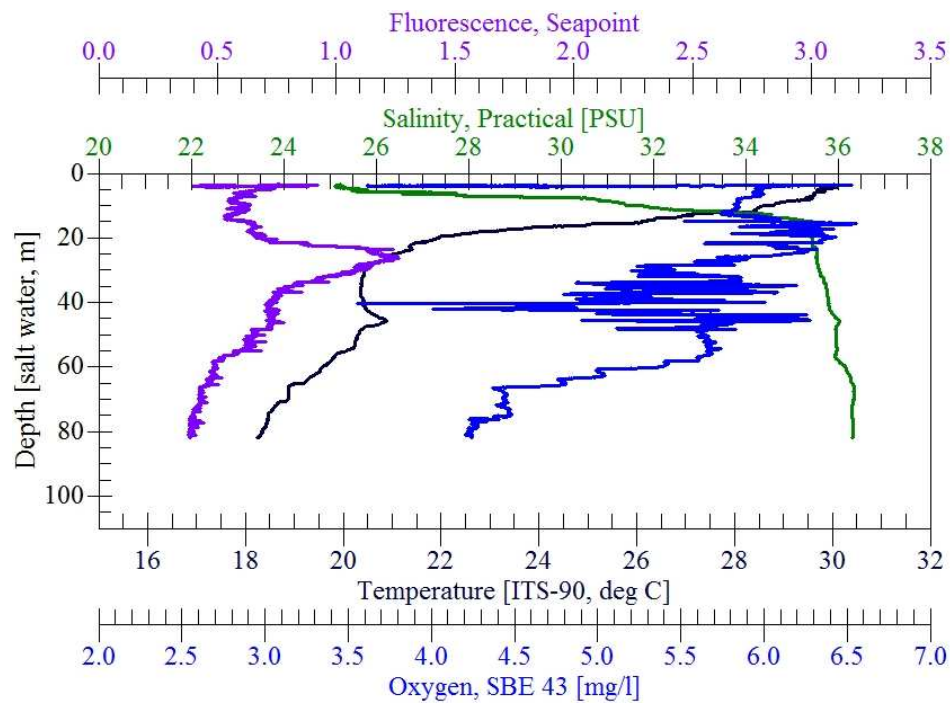


Figure 13. CTD cast WS005 at AAR on June 30, 2014

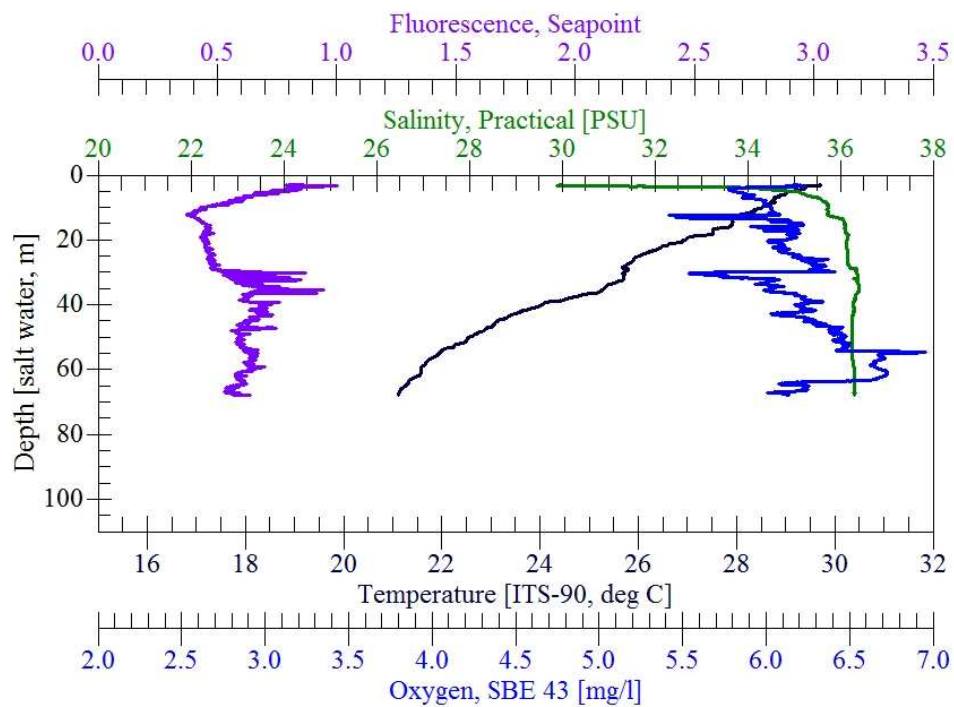


Figure 14. CTD cast WS006 at AAR on June 30, 2014

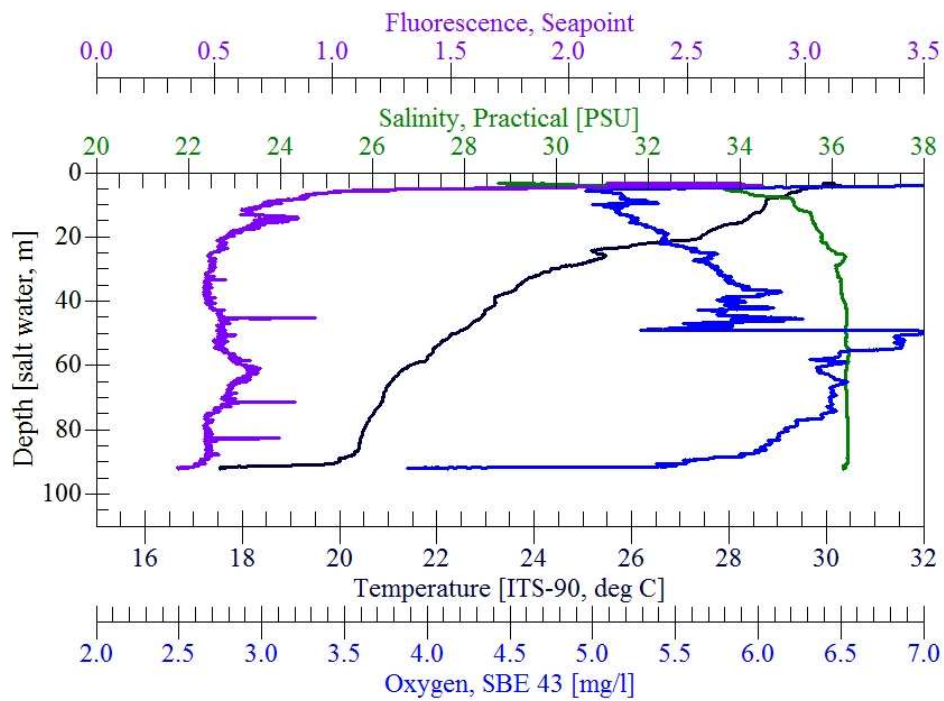




Figure 15. CTD cast WS007 at AAR on July 1, 2014

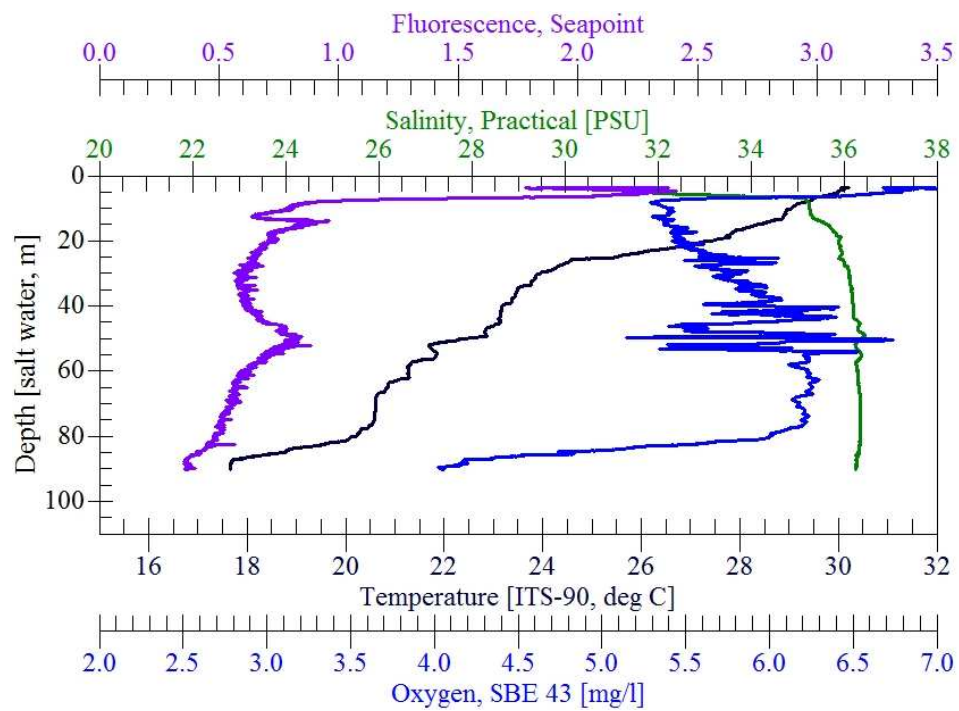


Figure 16. CTD cast WS008 at YTR on July 4, 2014

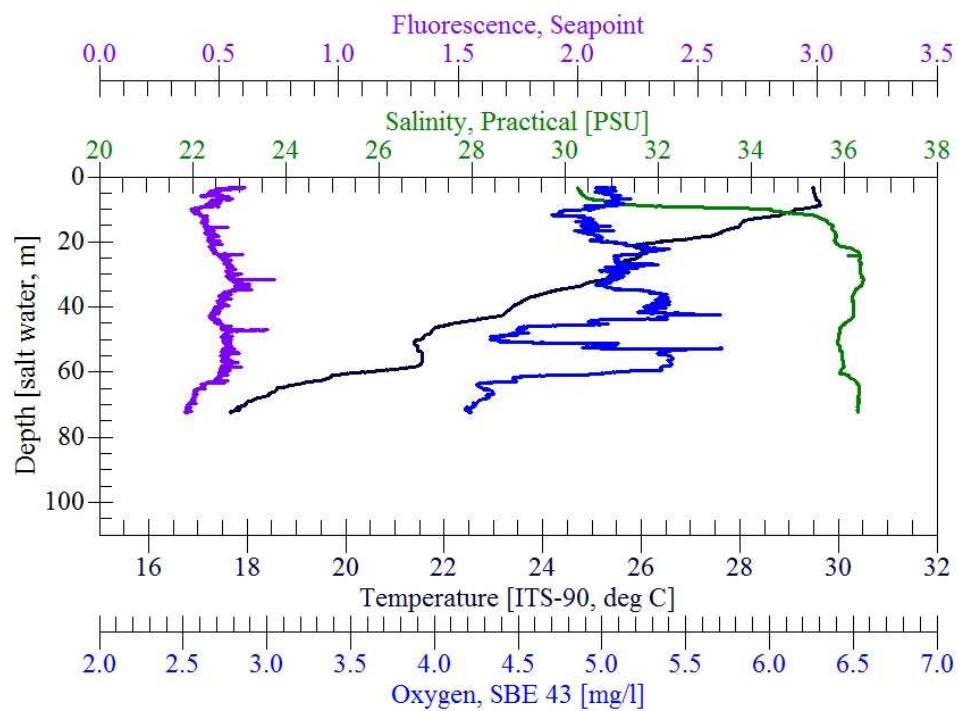


Figure 17. CTD cast WS009 at CTR on July 6, 2014

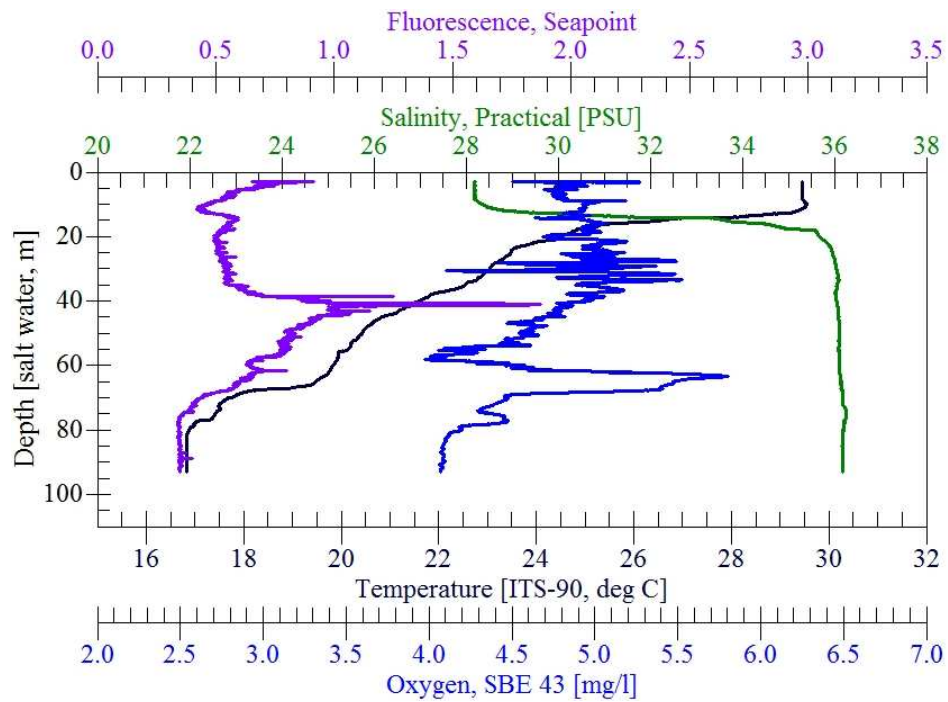


Figure 18. CTD cast WS010 at MSR on July 9, 2014

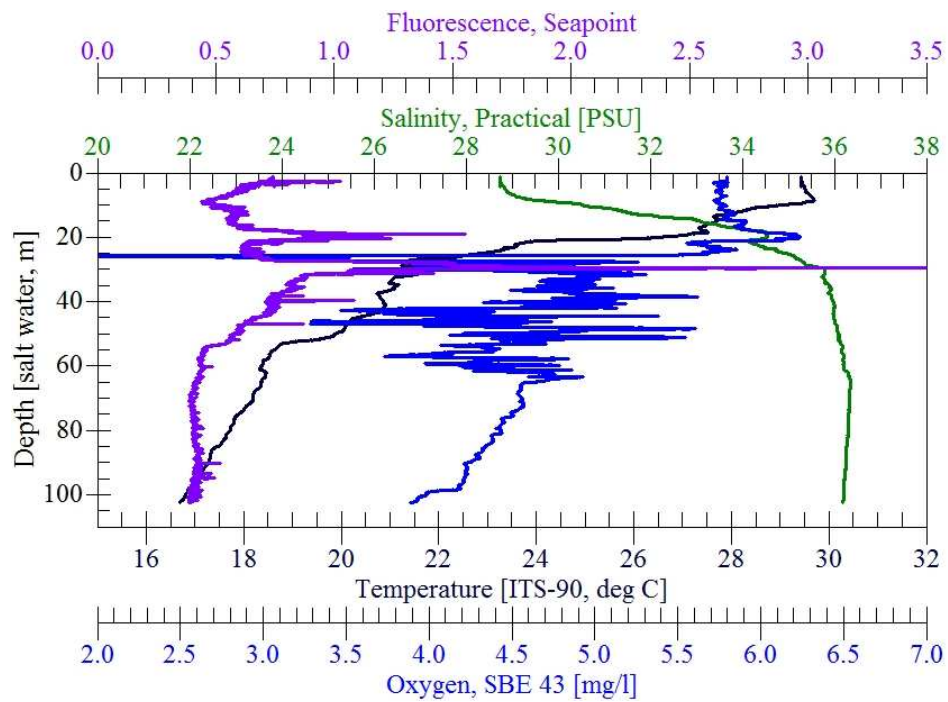


Figure 19. CTD cast WS011 at RTR on July 12, 2014

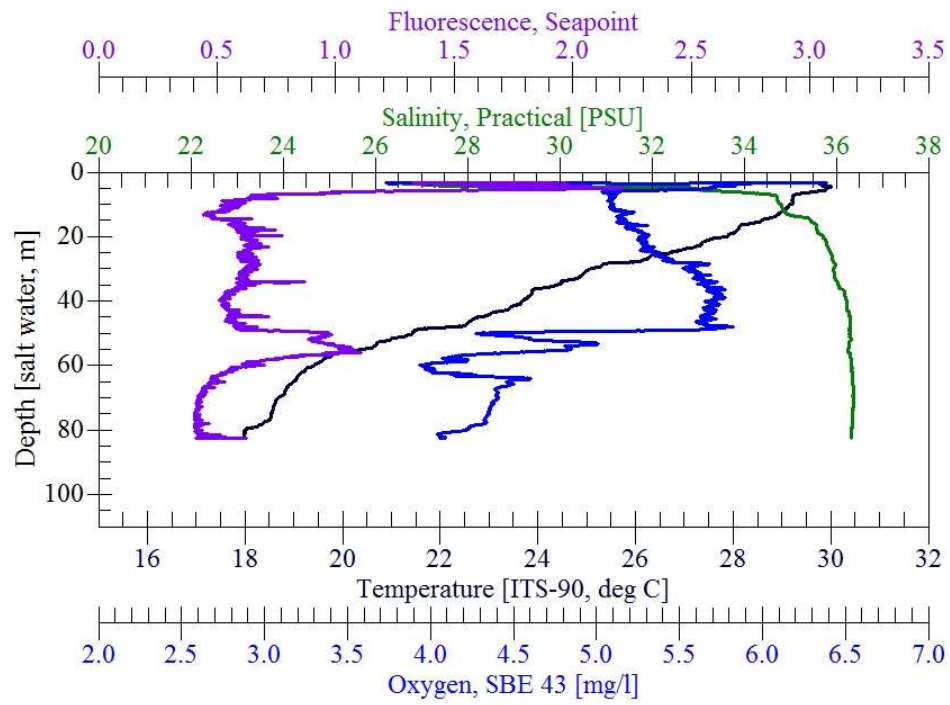


Figure 20. Rotary Time Lapse Camera, positioned on front of ROV for deployment. Float on top maintains upright position; reflective tape helps ROV operators locate the camera for retrieval. Battery pack on bottom provides base and ballast. Camera rotates inside the glass housing.



Figure 21. Markers on the bottom. On left, Marker “U” deployed in 2011; on right, Marker #3 deployed in 2014. Between the markers, a large colony of the gorgonian octocoral *Hypnogorgia pendula* is toppled and missing branches.





Figure 22. Low concrete domes deployed in 2014, identified as Marker “A” and Marker “K”. Marker “K” is shown below. A colony of the black coral *Antipathes furcata* is in front of the marker.

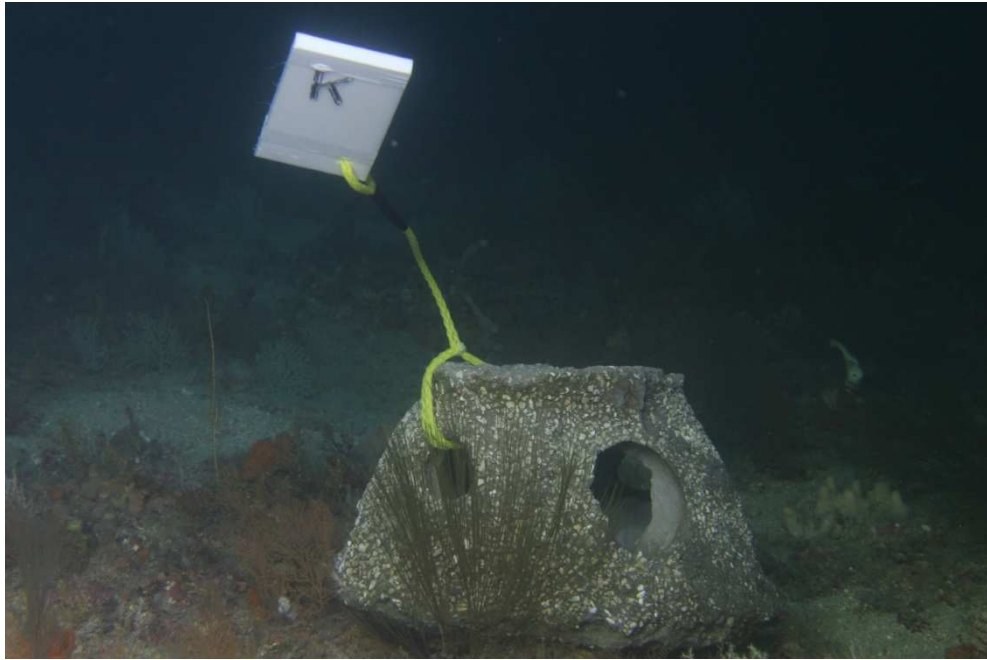


Figure 23. Sampled sea fans were photographed with a label and scale on a clean background in the ship's wet lab. Subsamples were subsequently taken and preserved in 95% ethanol for morphological and DNA analyses. Image is of sample number WS5-P1-E0701-T-AAR-GX013-1617-0042A, a *Placogorgia* sp.



Figure 24. Personnel for Leg I. From left to right: Mike Randall, JD Dubick, James Sherwood (kneeling), Mike Nicholson, Bill Nelson (ship 1<sup>st</sup> mate, kneeling), Toshi Mikagawa, Mauricio Silva (kneeling), Gene Otto (ship crew), Pete Lazarevich (kneeling), Melissa Price (seated), Ursula Nash, Dr. Peter Etnoyer, Todd Hendrickson (back; ship crew), Mike Shoup (ship engineer), Dr. Ian MacDonald (front), Denis Ilias (ship technician)



Figure 25. Personnel for Leg 2. From left to right: James Sherwood, Jared Jacobini, Mike Randall, Mauricio Silva, Toshi Mikagawa, Leslie Wilkes (seated), Nick Bach, Caroline Johansen (seated), Janessy Frometa (seated), Eric Howarth, Mike Nicholson, Ann Foster



## APPENDICES

Appendix 1. Daily status logs for 2014 Mesophotic Cruise.

### Daily Report Prepared By:

Author Name	Position	Email
Peter Etnoyer	Chief Scientist	peter.etnoyer@noaa.gov

### Vessel science party:

Role	Name	Affiliation	Email
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### 6/23 General Location Descriptions:

Gulf of Mexico, Gulfport MS

#### Station numbers/Transect Numbers:

none

### Daily Operations:

ROV setup, ship orientation, safety meeting, fire drill, science meeting, and ROV dunk test

### Operational / Logistical issues:

None

### Daily Log:

0800 Laboratory and ROV setup

1300 Orientation, safety meeting, fire drill

1500 Science meeting  
1700 ROV dunk test

#### **6/24 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps Reef

#### **Station numbers/Transect Numbers:**

CTD-O cast (Event 1003), ROV CTD casts (ROV001, ROV002, ROV003). Three dives (Dives GX001 - GX003). Nine transects Transect 001 – Transect 009. One rotary camera deployment (Event 1027).

#### **Daily Operations:**

Transponder calibration, laser check, deploy ship CTDD0 w/fluorometer, deploy ROV for Dives GX001, GX002 and transects 001– 009; deploy ROV for Dive GX003 and Rotary Camera 1.

#### **Operational/Logistical issues:**

First transponder test failed due to battery short. ROV had temporary loss of telemetry, temporary loss of thruster power.

#### **Daily Log:**

0600 Calibrate navigation, transponder test  
0800 Second transponder test, Event 1002  
0930 Reposition block for ship CTDDO  
1000 Calibrate lasers  
1045 Deploy ship CTD DO  
1250 Deploy ROV for Dives GX001 and GX002, transects and imaging  
1624 ROV off bottom, recover ROV  
1800 Deploy ROV for Dive GX003, rotary camera  
1841 Deploy rotary camera  
1910 Recover ROV  
2030 Science meeting

#### **6/25 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps Reef

#### **Station numbers/Transect Numbers:**

No transects. One rotary camera deployment (Event 1027). ROV CTD cast (ROV004). One dive (Dive GX004). Collected 50 random forward -looking images. Collected four yellow Plexauridae sea fans and one opportunistic sea fan sample, *Swiftia exserta*.

#### **Daily Operations:**

Deploy ROV for Dive GX004. Deploy Rotary Camera 2. Attempt transects on east side of reef. Attempt down looking images. Conduct random forward-looking image survey. Collect samples. Operational / Logistical issues:

Bottom conditions were murky, estimated 2-foot visibility. ROV had frequent, periodic losses of telemetry and thruster power for brief periods of time. Navigation was lost occasionally due to



distance from the ship. Ship ADCP was inconsistent with actual surface currents. Ship had trouble steering due to surface currents, and close proximity of ROV tether and buoy, 50 meters off the stern.

#### **Daily Log:**

0730 Deploy transponder pole  
0830 Deploy ROV  
0930 ROV descending  
1100 Deploy Rotary Camera 2, Event 1033  
1153 Imaging corals  
1222 Sampling corals (Events 1035 and 1036)  
1400 Commence random forward-looking images  
1900 Recover ROV  
2100 Science meeting

#### **6/26 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps Reef

#### **Station numbers/Transect Numbers:**

One dive (Dive GX005). One transect, Transect 010. Collected four yellow Plexauridae sea fans and one opportunistic sea fan sample, *Swiftia exserta*. One rotary camera recovery (Event 1096). Two ROV CTD casts (ROV005 and ROV006). One ship CTD-O cast (WS002). Deployed three new heavy markers (Events 1101, 1102, 1103).

#### **Daily Operations:**

Repositioned transponder on the ROV to address navigation problems. Replaced the ROV computer to address loss of telemetry and thruster power. Placed black tarp over ROV van to cut glare.

Deployed the ROV for Dive GX005. Attempted transects on east side of reef, unsuccessful due to poor visibility. Collected small yellow sea fans. Collected forward-looking images. Recovered rotary camera 1.

Deployed the ROV for Dive GX006. Deployed three heavy markers. Conducted one ship CTD cast. Transiting to Roughtongue Reef one day early due to poor visibility. Planning to return to Alabama Alps in three to four days, once visibility clears.

#### **Operational / Logistical issues:**

Commercial fishing ship 'Alice C' was anchored on site overnight and in the morning. Ship was asked to relocate. Walton Smith had a minor steering malfunction that was quickly repaired. ROV performance improved once computer was swapped. ROV had no losses of telemetry and thruster power. Navigation was improved by the new position for the ROV transponder. Ship had less trouble steering in currents. Black tarp cut glare to the wheelhouse. Radio communications were improved.

Random down-looking images were not useful due to poor visibility. Recovery of rotary camera resulted in the release of a small flotation buoy to the surface. The buoy was sighted and recovered by ships crew using a grappling hook.

Bottom conditions were murky again for the second day, estimated 2-foot visibility. No further operations will be attempted at this site. Ship is moving to Roughtongue Reef one day early. Ship will return to Alabama Alps Reef in 3-4 days, in anticipation of improved visibility.

#### **Daily Log:**

0800 Reposition transponder, replace ROV computer, install tarp to cut glare to wheelhouse  
0900 ROV delayed to position of commercial fishing ship  
0940 ROV delayed by ship steering repair  
1030 ROV deployed for GX005  
1100 ROV on bottom  
1111 Start transects. One 2.5 minute transect conducted, not useful.  
1130 Sampling corals (Events 1091 - 1095)  
1300 Searching for markers, unsuccessful.  
1400 Searching for Rotary Camera 1.  
1445 Located and recovered Rotary Camera 1. Buoy detached, floats to surface.  
1530 Buoy recovered. ROV recovered. Samples recovered and processed.  
1700 ROV deployed for GX006 with three steel markers.  
1743 ROV on bottom  
1800 Markers deployed near large sea fans (Events 1101, 1102, 1103)  
1900 ROV off bottom  
1920 ROV on deck  
2030 Ship CTD-O cast WS002, Event 1105  
2130 Relocating to Roughtongue Reef

#### **6/27 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Roughtongue Reef.

#### **Station numbers/Transect Numbers:**

One ship CTD-O cast (WS003). One dive (Dive GX007). One rotary camera deployed (Event 1109). Two ROV CTD casts (ROV007 and ROV007b). Seventeen transects, Transect 011-027. Collected one white Plexauridae sea fan. Collected 80 random downlooking images.

#### **Daily Operations:**

Deployed the ROV for Dive GX007. Deployed rotary camera 1. Conducted seventeen 2-5 minute transects on the west side of the reef, with good visibility. Collected one white sea fan (Plexauridae). Collected 80 random down-looking images. Arrival of a front accelerated winds to 15 knots, gusting to 20 knots. Sea state was 3-4. ROV was immediately recovered to avoid equipment damage and maintain personnel safety.

**Operational / Logistical issues:**

Following ROV recovery, the science team, ROV team, and ship held a meeting to discuss station holding and ship operations. The idea of a clump weight was proposed by the Captain and considered by the ROV team, in order to operate in moderate seas. ROV team stated that the use of a clump weight may result in tether damage and subsequent delays. ROV team also stated that a clump weight would not necessarily improve ship handling. It was decided that the system was working well in winds less than 15 knots, so we would proceed without a clump weight, and revisit the option if necessary in the future.

Following passage of the weather front, we experienced reduced winds and a lower sea state within one hour. We planned to redeploy the ROV to collect samples and transects. One vertical thruster was not operational during the pre-deployment checkout. This was diagnosed as a blown fuse. The ROV team opened the electronics cylinder and replaced the blown fuse. The procedure left insufficient time to launch and recover again before the end of the operational day. High winds are expected tomorrow. The team will carefully evaluate weather conditions tomorrow morning before commencing operations.

**Daily Log:**

0730 Ship CTD-O cast WS5-003  
0822 ROV in water  
0845 ROV on bottom, visibility is good  
0851 Deploy Rotary Camera 1  
0930 Begin transects  
1115 Sample white sea fan (Event 1122)  
1200 Commence random down-looking images  
1600 ROV recovered due to weather  
1700 Science, ship captain, ROV meeting

**6/28 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Roughtongue Reef.

**Station numbers/Transect Numbers:**

One dive (Dive GX008). One rotary camera repositioned (Event 1109). One ROV CTD cast (ROV008). Twenty-four video transects, transect numbers 028-052. Collected sixteen sea fans – *Bebryce*, *Paramuricea*, *Nicella*, white *plexauridae*. Collected 120 random downlooking images.

**Daily Operations:**

Weather was better than anticipated. Deployed the ROV for Dive GX008. Collected many small sea fans in several taxa for morphological and genetic identification, to voucher observations in video transects. Repositioned rotary camera 1 “Huey” to the east side of reef. Conducted twenty-four (n=24) transects of 2-5 minute duration with good visibility. Collected 20 random down-looking images from the northwest quadrant to complete yesterday’s work. Collected 100 random down-looking images from the northeast and southeast quadrants for comparison.

**Operational / Logistical issues:**

The ROV operated very well without a clump weight. There were some ship handling issues in the late afternoon, but the loss of time was small, about ninety minutes. Ship handling improved towards the end of the day.

**Daily Log:**

0800 ROV in water  
0830 ROV on bottom, visibility is good  
0845 Collected sea fan samples  
0915 Begin transects  
1030 Located rotary camera 1 “Huey” and repositioned to the east  
1045 Commence 20 random down-looking images to complete ‘west’ set  
1200 Conduct ‘noon time’ video transects  
1345 Begin 100 random down-looking images to complete ‘east’ set  
1600 End 100 random down-looking images to complete ‘east’ set  
1615 Ship blown off reef, ROV off bottom, repositioning  
1730 ROV back on bottom, sampling small sea fans  
1745 Conduct afternoon video transects  
1845 End of operations  
1905 ROV on deck

**6/29 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Roughtongue Reef.

**Station numbers/Transect Numbers:**

Two dives (Dive GX009 and GX010). Deployed seven markers (Markers 1-3, 10, 13, A and K). One rotary camera recovered (Event 1392). Two ROV CTD casts (ROV009 and ROV010). Seventeen video transects, transect numbers 053-070. Collected one marker “I” from 2011 and two sea fans – both orange plexauridae. Conducted one ship CTD-O cast (WS004)

**Daily Operations:**

Weather was good, sea state 1-3. Deployed the ROV for Dives GX009 and GX010. Dive GX009 began by searching for markers deployed in 2011 and 2010. Of seven markers we sought over the course of the day, we found six, and recovered one (Marker “I”) that was no longer serving a purpose. We deployed new steel markers at five of the seven locations, and two new concrete markers at previously unmarked locations. We recovered one rotary time-lapse camera. Dive GX010 conducted seventeen (n=17) transects of 2-5 minute duration with good visibility, and two orange plexauridae corals.

**Operational / Logistical issues:**

None.



**Daily Log:**

0800 ROV in water for Dive GX009  
0830 ROV on bottom, visibility is good  
0845 Deployed markers 1, 2, 3 and recovered marker "I"  
1215 Recovered rotary camera 1 "Huey"  
1245 Recovered ROV  
1345 ROV in water  
1400 Deploy markers 10 and 13  
1545 Begin video transects  
1800 Sampling orange plexauridae  
1845 ROV on deck  
1945 Ship CTD-O  
2000 Start ship transit to AAR  
2030 Science meeting

**6/30 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps.

**Station numbers/Transect Numbers:**

Conducted one ship CTD-O cast (WS004). Two dives (Dive GX011 and 012). Deployed two markers (Markers 4-11). One rotary camera recovered (Event 1392). Two ROV CTD casts (ROV011 and ROV012). Twenty video transects were conducted, transect numbers 071-091. Collected seven sea fans – all suspected to be *Placogorgia* spp. Sample numbers 033 – 040.

**Daily Operations:**

Weather was good. Deployed the ROV for Dives GX011 and GX012. Dive GX011 began by deploying two markers in the north quadrant, and then conducted a set of 100 random down-looking images; 75 were achieved. Fish team began 'noon time' transects at 1100. Dive GX012 conducted seven (n=7) transects of 2-5 minute duration. Rotary camera was recovered at 1230, and ROV on deck at 1300.

Dive GX012 deployed one rotary camera and conducted thirteen (n=13) transects of 2-5 minute duration. Seven sea fans samples (n=7) were collected. A science meeting was held among the PIs at 1500. The team decided to stay to complete the work at AAR, rather than transit to YTR.

**Operational / Logistical issues:**

CTD-O deployment was compromised by battery failure or short circuit; repaired by afternoon. Commercial fishing boat 'Angela C' was anchored on site, and prevented transect operations in the south and central sectors. Ship recovered the ROV one hour early while Angela C moved off site.

**Daily Log:**

0500 Drift test  
0600 Deploy transceiver pole  
0630 Ship CTD-O cast at AAR  
0730 Deploy ROV for Dive GX011 with 2 markers  
0813 Deploy markers  
0850 Conduct random down looking images  
1100 Conduct 'noon time' video transects  
1230 Recover rotary camera 2 "Duey"  
1252 Recover ROV  
1400 Deploy ROV for Dive 012 with Rotary Camera 1 "Huey"  
1430 Conduct afternoon video transects  
1620 Coral sampling and high-resolution imaging  
1809 ROV off bottom  
1845 CTD-O cast WS006

**7/01 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps.

**Station numbers/Transect Numbers:**

One dive (Dive GX013). One rotary camera recovered (Event 1618). One ROV CTD cast (ROV013). Thirteen (n=13) video transects conducted, transect numbers 092-105. Three markers identified (M3, M4, M8). Random images were 35 (Events 1557- 1613). Collected two sea fans – suspected *Placogorgia*, sample numbers 041 – 042. One ship CTD cast (WS007).

**Daily Operations:**

Weather was good. Deployed the ROV for Dive GX013. Dive began by conducting thirteen (n=13) video transects. Three markers from 2011 were identified and imaged. Conducted a set of 100 random down-looking images; 35 random images were achieved. Rotary camera was recovered at 1642, and ROV on deck at 1705.

**Operational / Logistical issues:**

Strong currents (est. 1 knot on bottom) prohibited completion of 100 random images. The ROV was recovered early due to currents.

**Daily Log:**

0500 Drift test  
0600 Deploy transceiver pole  
0800 Deploy ROV for Dive GX013  
0830 Conduct 'morning time' video transects  
1030 Search for markers from 2011  
1410 Random down-looking images  
1625 Located rotary camera 2 "Huey", assessed weather and visibility for recovery

1630 Image and collect sea fan samples  
 1645 Recover “Huey”  
 1705 Recover ROV  
 1800 CTD-O cast WS007  
 1830 Lift transceiver pole  
 1900 Steam towards Gulfport

**7/02 in Gulfport- Port Day.** Transition to leg 2 crew

**Daily Report Prepared By:**

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**7/03 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps.

**Station numbers/Transect Numbers:**

None

**Daily Operations:**

In port for science party changeover and ship resupply. New science parties from NOAA, FSU, and USGS arrived without incident. Handover proceeded smoothly. Science meeting and introductions meeting was held at 1600, followed by ship briefing for new crew and ship safety drills. Ship left dock at 1800 and is proceeding to Yellowtail Reef

**Operational / Logistical issues:**

None (now that coffee crisis has been resolved with 2X resupply)

**Daily Log:**

1600 Science Meeting

1700 Ship Safety Briefing and Drills

1800 Depart Gulfport; steam for Yellowtail Reef

**7/04 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps.

**Station numbers/Transect Numbers:**

Transects 106-124

Events 1623-1660

**Daily Operations:**

On location 0400. Lowered pole at 0700, did ship CTD @0730. ROV in water at 0815. Ship was off target; moved onto reef. ROV was not reporting on navigation. We placed ROV on bottom and tried multiple diagnostic and resets of navigation with no results. There were multiple error messages. Retrieved ROV at 1000, removed transponder and did lab and rope test- no results. Lifted pole and tested connections- reset pole. In reading manual, it was suggested to set transponder to pinger mode. We redeployed ROV at 1330 with transponder in pinger mode. ROV had navigation, but was very low quality. We did fish transects, coral imaging, and fish imaging, while Eric managed to contact Pete and resolve the issue. Retrieved the ROV at 1830- removed transponder and reset to transponder mode, did a rope test- and had tracking with new settings.

**Operational / Logistical issues:**

Issues with non-functional navigation resulted in ROV being retrieved and on deck until 1330. Remainder of day had low quality navigation. Issue appears to be resolved.

**Daily Log:**

0700 lower nav pole

0730 CTD cast

0800 prep ROV; in water at 0815

0830-0945 try to resolve lack of navigation

1000 ROV back on deck; Rotary camera Dewey removed and downloaded

1000-1330 try to resolve lack of navigation

1410 ROV back on bottom

1410-1830 Transects, coral imaging, fish imaging

1830 recover ROV; on deck 1900

### **7/05 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Alabama Alps.

### **Station numbers/Transect Numbers:**

Transects:19 (125-144)

Events: 140 (1661-1801)

Samples:4 (45-49)

Random points:100 (358-458)

Time lapse camera:1

Coral markers:2

### **Daily Operations:**

Tried to Sabiki fish at 0700. Strong currents kept lines from reaching bottom . No catch. Dive GX016 in water at 0816. Deployed rotary cam at 0839. Started taking 100 random points at 0840; finished at 1140. Located damaged Swiftia during random points. Navigated back to colony after finishing random points and dropped markers overboard. ROV immediately located markers, deployed one next to damaged colony, and extensively documented colony. Proceeded to do fish transects (19) and imaging of fish until 1515. At 1515 started documenting coral colony health. Relocated second marker to a second damaged Swiftia colony. Collected four samples; yellow, white, and orange plexaurids . Retrieved ROV at 1800; lifted nav pole and are underway to Coral Trees Reef

### **Operational / Logistical issues:**

ROV navigation was excellent. Use of fish transect times to aid in relocation of damaged colonies resulted in a quantity of time wasted trying to relocate a specific colony. For tomorrow, we are going to try having a coral person in the van with a fish person, so that damaged colonies can be returned to immediately after the transect is ended. Fishing in a non-anchored situation is very challenging.

Calm seas and excellent weather; coffee supply is holding up.

### **Daily Log:**

0700-0730 Attempted sabiki angling

0815 Launch ROV

0830 Deploy Rotary camera Dewey

0900-1200 random points

1200 deploy coral markers

1215-1515 fish transects and imaging (closeup images of balloonfish, purplemouth moray, two-spot cardinalfish, creole fish)

1515-1745 Coral imaging and marking

1800 Recover ROV

1815 Raise nav pole

**7/06 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Coral Trees Reef.

**Station numbers/Transect Numbers:**

Transects:26 (145-171)

Events: 195 (1802-1997)

Samples:6 (49-54)

Random points:150 (458-608)

Time lapse camera:1

Coral markers:0

**Daily Operations:**

Arrived on Coral Trees Reef around 0500. Tried to Sabiki fish at 0700; got on bottom, but were over sand. Caught lizardfish and porgy. Lowered nav pole at 0700. Dropped CTD at 0730. Launched ROV at 0800 with rotary camera Huey. Deployed Huey at 0900. Conducted fish transects, coral imaging, fish imaging, and coral collection until 1440. Imaged 150 random points from 1450 to 1740. Collected coral until 1830; retrieved ROV at 1846.

**Operational / Logistical issues:**

None. Coral Trees is a very challenging place to navigate a ROV. Unlike the rest of the reefs surveyed earlier in the cruise, Coral Trees is far more rugose, with overhanging ledges everywhere. ROV and navigation performed admirably.

Calm seas and excellent weather; coffee supply is holding up.

**Daily Log:**

0600-0630 Attempted sabiki angling

0700 Lower nav pole

0730 CTD

0800 Launch ROV

0900 Deploy Rotary camera Huey

0900-1440 Fish transects, coral imaging, fish imaging, coral collections

1450-1740 random points

1745-1830 Coral collecting

1846 Recover ROV

**7/07 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Coral Trees Reef.

**Station numbers/Transect Numbers:**

Transects:19 (172-191)

Events: 31 (1998-2029)

Samples:3 (55&56)

Random points:0

Time lapse camera:1 recovered

Coral markers:0

**Daily Operations:**

Tried sabiki fishing at 0700. No catch of targeted species. Launched ROV at 0800. Located and retrieved rotary camera Huey at 0819. Realized Huey was not functioning. Towed ROV south with boat to next reef section- dropped Huey at a central location for retrieval at the end of the dive. Started fish transects and coral imaging at 0900. Ran 19 transects before starting coral collections at 1200. At 1300 we were notified that the ship was having mechanical issues with the variable pitch prop on the starboard side. We recovered camera Huey and the ROV at 1330; ROV was on deck at 1345. Ship crew has been working on solving the problem since that time.

**Operational / Logistical issues:**

Rotary camera Huey only ran for 2:45 after deployment yesterday. Diagnosed as a battery problem; has been running on new LI batteries in lab since 1400. Ship had issues with variable pitch sender on starboard prop at 1300. Captain and crew have been trying to diagnose and solve issue since then.

**Daily Log:**

0700 Attempted sabiki angling

0800 Launch ROV

0819 Locate and secure rotary camera Huey

0819-0900 Translocate Huey to next reef section. Realize Huey is not working. Leave Huey in central location for later retrieval

0900-1300 Fish transects, coral imaging, fish imaging, coral collections

1300- Notified that ship has a mechanical problem

1330 Recover Huey

1345 Recover ROV

**7/08 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Coral Trees Reef.

**Station numbers/Transect Numbers:**

Transects:20 (192-212)

Events: 185 (2030-2215)

Samples: 0

Random points:148

Time lapse camera:1 (deployed and recovered on same dive)

Coral markers:2

**Daily Operations:**

Sabiki fishing 0700-0730. No catch of targeted species. Launched ROV at 0800. Deployed Huey at 0839, Started random points; took approximately 140 random points. Had to abort one set due to large line wrapped extensively throughout region. At 1240 started transects and coral imaging. Deployed marker #7 at 1349. Ran more transects; deployed marker #15 at 1643. Ended transects at 1700- started to collect corals and realized there were thruster issues with ROV. Moved to Huey location; recovered Huey. Recovered ROV at 1815.



**Operational / Logistical issues:**

Captain and engineer solved pitch control issue at 2000, using a hacked UPS, toggle switch, and extension cord. Engineer rewired the old servo system today and is calibrating system currently. ROV had thruster control issues starting sometime around 1600. Turned into a major control issue around 1700. We aborted sampling and recovered Huey, then recovered the ROV. Recovery went smoothly, but tether has 8 turns- we may take the turns out later- Toshi is evaluating. Rebooted control computer and problem disappeared. The good news- the problem is solved. The bad news- we don't know why the problem happened.

**Daily Log:**

0700 Attempted sabiki angling

0800 Launch ROV

0839 Deploy rotary camera Huey

0840-1240 Random points

1240-1700 Transects, coral imaging, deployment of coral markers

1700-Went to sample corals- having control issues. Aborted sampling and went to recover Huey

1800 Recover Huey

1815 Recover ROV

1900 Nav pole up

Begin transit to MSSR

**7/09 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Coral Trees Reef.

**Station numbers/Transect Numbers:**

Transects:37 (213-249)

Events: 143 (2216-2359)

Samples: 10

Random points:88

Time lapse camera:1

Coral markers:0

**Daily Operations:**

On site at 0400. Deployed nav pole at 0700; did CTD at 0730. Launched ROV at 0830.

Deployed Huey at 0839. Started random points; did 88 random points until 1200. Started fish transects and coral collections/ imaging- conducted 37 transects and collected 10 samples by 1730. Had issues with aggressive amberjacks disrupting activities- retrieved ROV at 1730. On deck at 1800.

**Operational / Logistical issues:**

All systems worked well today. The only issue occurred with aggressive amberjack swarming around the ROV and disrupting operations towards the end of the day. We will do random points in the afternoon/ evening for the next two days to reduce the amberjack issue.

**Daily Log:**

0700 Deployed nav pole  
0730 Did CTD drop  
0830 Launch ROV  
0839 Deploy rotary camera Huey  
0900-1215 Random points  
1215-1730 Transects, coral imaging, coral sampling  
1730 Recover ROV  
1800 ROV on deck

**7/10 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Madison Swanson Reef.

**Station numbers/Transect Numbers:**

Transects: 27 (250-276)  
Events: 137 (2360-2497)  
Samples: 0  
Random points: 96  
Time lapse camera: 1 recovered  
Coral markers: 2

**Daily Operations:**

ROV in water at 0811. Started fish transects and coral imaging- conducted 27 transects and deployed one marker by 1300. Today we were greeted upon entry into the water by an estimated 200 amberjack; on reaching the bottom, they were joined by approximately 50 large red snapper, and a mixed bag of scamp; red, gag, and black grouper; and speckled hind, all treating the ROV as a free lunch wagon. Gave up on transects at 1300 and did random points. Did 96 random points, deployed the second coral marker, then transited to recover Huey. Retrieved Huey at 1740; ROV on deck at 1800.

**Operational / Logistical issues:**

All systems worked well today. We had some rain squalls come through; all hands were on the back deck taking photos of a small waterspout around 1100. Changing random points to the afternoon did nothing to reduce the amberjack issue. We did get some great photos of snapper, grouper, and hinds as they scarfed up fish in the ROV lights- but the continual presence of hundreds of large predators has impacted the behavior of the small fish during transects. Water was very clear.

**Daily Log:**

0811 Launch ROV  
0825-1300 Transects, coral imaging, coral marker deployment  
1300-1700 Random points  
1730 Recover Huey  
1800 ROV on deck

### **7/11 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Madison Swanson Reef.

### **Station numbers/Transect Numbers:**

Transects:29 (277-305)

Events: 138 (2498-2635)

Samples: 1

Random points:100

Time lapse camera:1 deployed and recovered on same dive

Coral markers:0 (all markers deployed)

### **Daily Operations:**

Slowly moved to Madison Swanson North Ridge overnight. ROV in water at 0805. Deployed Huey at 8:20. Started fish transects and coral imaging- doing transects to get a feel for this region. We have very low quality bottom topography for this reef. Reef turned out to be a long scarp. Wall is about 8-10 meters high, with a talus slope below it. Depth at the base of the talus slope is about 80 meters; depth at top of the wall is about 67 meters. Wall is made up of sedimentary rocks with distinct layering, which have broken off in angular blocks, falling to the slope below. Top of reef is a slightly rising narrow ridge, mostly sediment with occasional rock surfaces. Crest of ridge rises about two meters to minimum depth of 65 meters before sloping back down to mud. We ran transects along the talus blocks, along the reef edge, diagonally across the reef ridge, and along the ridge crest. Reef is a very unique feature that clearly did not come from the same geological origin as Madison Swanson South Ridge. Very low coral growth- scrubby and sparse. Much lower numbers of grouper and amberjack than yesterday. Most of the antheids were along the reef crest, in the upper meter of the face. Surveyed about 3 km while doing 29 transects. Did some fish imaging –serranus notospilus was more common here than at any other site we have visited. Collected one coral sample then started random points. Did 100 random points, retrieved Huey, and recovered ROV at 1600. Raised nav pole and started steam to RTR/YTR.

### **Operational / Logistical issues:**

All systems worked well today. Excellent clarity. Low quality bottom imaging, with very coarse resolution, was at least spatially excellent- we found the wall exactly where the background image suggested it should be. No large sea fans; all indications are that this is generally a very low current region, unlike the South Ridge.

### **Daily Log:**

0805 Launch ROV

0820 Deploy Huey

0825-1300 Transects, coral imaging, coral marker deployment

1300-1530 Random points

1530 Recover Huey

1600 ROV on deck

1630 Nav pole up

1700 start steam to RTR

### **7/12 General Location Descriptions:**

Gulf of Mexico, Gulfport MS, Roughtongue and Yellowtail Reefs.

### **Station numbers/Transect Numbers:**

Transects:0

Events: 12 (2635-2646)

Samples: 0

Random points:0

Time lapse camera:1 (recovered Dewey, deployed on YRT on 7/5/14)

Coral markers:0 (all markers deployed)

### **Daily Operations:**

Transited overnight to Roughtongue Reef. Went to Saabiki at 0600 only to discover we were a mile off the reef and the crew was changing the engine oil. Tried to Sabiki anyway; got two bonita, a bar jack, and two sand tilefish. No target species. Did CTD, steamed to reef, and discovered we had no ROV navigation. All program settings were incorrect. We lowered the pole, got the program to display ship position and the overlay, and launched the ROV on RTR to do fish photos. After significant difficulty trying to deal with not knowing where the ROV was in regard to the ship, I decided to retrieve rotary camera Dewey. We slowly steamed over to YTR. By this time, Eric had also managed to get the program to display a screen showing the relative positions of the ROV and ship. By doing a split screen with the two displays, we were able to navigate towards Dewey's position and locate it on sonar. We retrieved Dewey and had the ROV on deck at 1230. We launched the ROV again at 1400, and spent from 1400-1730 imaging fish. Recovered the ROV and had it on deck at 1800. Raised the pole and began the steam to Gulfport.

### **Operational / Logistical issues:**

Navigation failed again. It does not seem to be a mechanical problem; the transponder was communicating with the receiver, and the system was able to display relative position of the ROV to the ship. Problem seems to be either a software problem or a lack of understanding of the software by the nav technician. Lack of navigation reduced our options to fish imaging. We were able to successfully recover rotary camera Dewey- the camera ran until midnight on the 11<sup>th</sup>. We did about 4 hours of fish imaging, including an unknown basslet or wrasse, orangeback bass, and several other fish.

### **Daily Log:**

0900 Launch ROV

0900-1100 Fish imaging

1100 recover Dewey

1200 ROV off bottom

1230 ROV on deck

1400 Launch ROV

1430-1730 Fish imaging

1730 ROV off bottom

1800 ROV on deck

1830 Nav pole up

1900 start steam to Gulfport

**7/13 into Gulfport** End of cruise

Back cover:

Image of DSSI Global Explorer taken by rotary camera Huey following deployment on dive GX009, on 6/29/2014 on Rough Tongue Reef

